NOVARTIS AG
Form 20-F
January 30, 2019

As filed with the Securities and Exchange Commission on January 30, 2019
UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington D.C. 20549

Form 20-F

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o REGISTRATION STATEMENT PURSUANT TO SECTION 12(b) OR 12(g) OF THE SECURITIES EXCHANGE ACT OF 1934
OR
x ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934 for the fiscal year ended December 31, 2018
OR
o TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
OR
o SHELL COMPANY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
Commission file number 1-15024
Novartis AG
(Exact name of Registrant as specified in its charter)
NOVARTIS Inc.
(Translation of Registrant's name into English)
Switzerland
(Jurisdiction of incorporation or organization)
Lichtstrasse 35
4056 Basel, Switzerland
(Address of principal executive offices)
Shannon Thyme Klinger
Group General Counsel
Novartis AG
CH 4056 Basel
Switzerland
Tel.: 011-41-61-324-1111
Fax: 011-41-61-324-7826
(Name, Telephone, E mail and/or Facsimile number and Address of Company Contact Person)
Securities registered pursuant to Section 12(b) of the Act:

Title of class	**Name of each exchange on which registered**
American Depositary Shares each representing 1 share	**New York Stock Exchange**
Ordinary shares, nominal value CHF 0.50 per share*	**New York Stock Exchange***

Securities registered or to be registered pursuant to Section 12(g) of the Act:
None
Securities for which there is a reporting obligation pursuant to Section 15(d) of the Act:
None
Indicate the number of outstanding shares of each of the issuer's classes of capital or common stock as of the close of the period covered by the annual report:
2,311,171,429 shares
Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.
Yes x **No** o

If this report is an annual or transition report, indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934.

Yes o **No** x

Note—Checking the box above will not relieve any registrant required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 from their obligations under those Sections.

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.

Yes x **No** o

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).

Yes x **No** o

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or an emerging growth company. See definition of “large accelerated filer,” “accelerated filer,” and “emerging growth company” in Rule 12b-2 of the Exchange Act.

Large accelerated filer x Accelerated filer o Non-accelerated filer o Emerging growth company o

If an emerging growth company that prepares its financial statements in accordance with U.S. GAAP, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards† provided pursuant to Section 13(a) of the Exchange Act. o

† The term “new or revised financial accounting standard” refers to any update issued by the Financial Accounting Standards Board to its Accounting Standards Codification after April 5, 2012.

Indicate by check mark which basis of accounting the registrant has used to prepare the financial statements included in this filing:

U.S. GAAP o | International Financial Reporting Standards as issued by the International Accounting Standards Board x | Other o

If “Other” has been checked in response to the previous question indicate by check mark which financial statement item the registrant has elected to follow.

Item 17 o **Item 18** o

If this is an annual report, indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act).

Yes o **No** x

* Not for trading but only in connection with the registration of American Depositary Shares representing such ordinary shares.

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Introduction and use of certain terms

Novartis AG and its consolidated affiliates publish consolidated financial statements expressed in US dollars. Our consolidated financial statements responsive to Item 18 of this Annual Report on Form 20-F (Annual Report) are prepared in accordance with International Financial Reporting Standards (IFRS) as issued by the International Accounting Standards Board (IASB). “Item 5. Operating and Financial Review and Prospects,” together with the sections on products in development and key development projects of our businesses (see “Item 4. Information on the Company—Item 4.B. Business overview”), constitute the Operating and Financial Review (“Lagebericht”), as defined by the Swiss Code of Obligations.

Unless the context requires otherwise, the words “we,” “our,” “us,” “Novartis,” “Group,” “Company,” and similar words or ph in this Annual Report refer to Novartis AG and its consolidated affiliates. However, each Group company is legally separate from all other Group companies and manages its business independently through its respective board of directors or similar supervisory body or other top local management body, if applicable. Each executive identified in this Annual Report reports directly to other executives of the Group company that employs the executive, or to that Group company’s board of directors.

In this Annual Report, references to “US dollars,” “USD” or “$” are to the lawful currency of the United States of America, and references to “CHF” are to Swiss francs; references to the “United States” or to “US” are to the United States of America, references to the “European Union” or to “EU” are to the European Union and its 28 member states, references to “Latin America” are to Central and South America, including the Caribbean, and references to “Australasia” are to Australia, New Zealand, Melanesia, Micronesia and Polynesia, unless the context otherwise requires; references to the “EC” are to the European Commission; references to “associates” are to employees of our affiliates; references to the “SEC” are to the US Securities and Exchange Commission; references to the “FDA” are to the US Food and Drug Administration, references to “EMA” are to the European Medicines Agency, an agency of the EU, and references to the “CHMP” are to the Committee for Medicinal Products for Human Use of the EMA; references to “ADR” or “ADRs” are to Novartis American Depositary Receipts, and references to “ADS” or “ADSs” are to Novartis American Depositary Shares; references to the “NYSE” are to the New York Stock Exchange, and references to “SIX” are to the SIX Swiss Exchange; references to “ECN” are to the Executive Committee of Novartis; references to “GSK” are to GlaxoSmithKline plc, references to “AAA” are to Advanced Accelerator Applications S.A., references to “AveXis” are to AveXis, Inc., and references to “Endocyte” are to Endocyte, Inc.

All product names appearing in italics are trademarks owned by or licensed to Group companies. Product names identified by a “®” or a “™” are trademarks that are not owned by or licensed to Group companies and are the property of their respective owners.

Forward-looking statements

This Annual Report contains certain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, Section 21E of the Securities Exchange Act of 1934, and the United States Private Securities –Litigation Reform Act of 1995, each as amended from time to time. Other written materials filed with or furnished to the SEC by Novartis, as well as other written and oral statements made to the public, may also contain forward-looking statements. Forward-looking statements can be identified by words such as “potential,” “expected,” “will,” “planned,” “pipelin “outlook,” or similar terms, or by express or implied discussions regarding potential new products, potential new indications for existing products, or regarding potential future revenues from any such products; or regarding the potential outcome, or financial or other impact on Novartis, of the proposed spin-off of our Alcon Division, or of the proposed divestiture of certain portions of our Sandoz Division business in the US; or regarding the potential impact of the share buyback plan; or regarding potential future sales or earnings of the Group or any of its divisions or potential shareholder returns; or regarding potential future credit ratings of the Group; or by discussions of strategy, plans, expectations or intentions. Such forward-looking statements are based on the current beliefs and expectations of management regarding future events, and are subject to significant known and unknown risks and uncertainties. Should one or more of these risks or uncertainties materialize, or should underlying assumptions prove incorrect, actual results may vary materially from those set forth in the –forward-looking statements. You should not place undue reliance on these statements.

In particular, our expectations could be affected by, among other things:

• Global trends toward healthcare cost containment, including ongoing government, payer and general public pricing and reimbursement pressures and requirements for increased pricing transparency;

• Regulatory actions or delays or government regulation generally, including potential regulatory actions or delays with respect to the proposed transactions or the development of the products described in this Annual Report;

• The potential that the strategic benefits, synergies or opportunities expected from the proposed transactions may not be realized or may take longer to realize than expected;

• The inherent uncertainties involved in predicting shareholder returns;

• The uncertainties inherent in the research and development of new healthcare products, including clinical trial results and additional analysis of existing clinical data;

• Our ability to obtain or maintain proprietary intellectual property protection, including the ultimate extent of the impact on Novartis of the loss of patent protection and exclusivity on key products that commenced in prior years and will continue this year;

• Safety, quality or manufacturing issues;

• Uncertainties regarding actual or potential legal proceedings, including, among others, actual or potential litigation with respect to the proposed transactions, product liability litigation, litigation and investigations regarding sales and marketing practices, intellectual property disputes and government investigations generally;

• Uncertainties involved in the development or adoption of potentially transformational technologies and business models;

• Our performance on environmental, social and governance measures;

• General political, economic and trade conditions, including uncertainties regarding the effects of ongoing instability in various parts of the world;

• Uncertainties regarding future global exchange rates;

• Uncertainties regarding future demand for our products; and

• Uncertainties regarding potential significant breaches of data security or data privacy, or disruptions of our information technology systems.

Some of these factors are discussed in more detail in this Annual Report, including under “Item 3. Key Information—Item 3.D. Risk factors,” “Item 4. Information on the Company,” and “Item 5. Operating and Financial Review and Prospects.” Should one or more of these risks or uncertainties materialize, or should underlying assumptions prove incorrect, actual results may vary materially from those described in this Annual Report as anticipated, believed, estimated or expected. We provide the information in this Annual Report as of the date of its filing. We do not intend, and do not assume any obligation, to update any information or forward-looking statements set out in this Annual Report as a result of new information, future events or otherwise.

Part I

Item 1. Identity of Directors, Senior Management and Advisers

Not applicable.

Item 2. Offer Statistics and Expected Timetable

Not applicable.

Item 3. Key Information

3.A Selected financial data

The selected financial information set out below has been extracted from our consolidated financial statements prepared in accordance with IFRS as issued by the IASB. Our consolidated financial statements for the years ended December 31, 2018, 2017 and 2016, are included in "Item 18. Financial Statements" in this Form 20-F.
All financial data should be read in conjunction with "Item 5. Operating and Financial Review and Prospects." All financial data presented in this Form 20-F are qualified in their entirety by reference to the consolidated financial statements and their notes.

	Year ended December 31,				
(USD millions, except per share information)	2018	2017	2016	2015	2014
INCOME STATEMENT DATA					
Net sales to third parties from continuing operations	51 900	49 109	48 518	49 414	52 180
Operating income from continuing operations	8 169	8 629	8 268	8 977	11 089
Income from associated companies	6 438	1 108	703	266	1 918
Interest expense	– 957	– 777	– 707	– 655	– 704
Other financial income and expense	185	39	– 447	– 454	– 31
Income before taxes from continuing operations	13 835	8 999	7 817	8 134	12 272
Taxes	– 1 221	– 1 296	– 1 119	– 1 106	– 1 545
Net income from continuing operations	12 614	7 703	6 698	7 028	10 727
Net income/(loss) from discontinued operations[1]				10 766	– 447
Group net income	12 614	7 703	6 698	17 794	10 280
Attributable to:					
Shareholders of Novartis AG	12 611	7 703	6 712	17 783	10 210
Non-controlling interests	3	0	– 14	11	70
Basic earnings per share (USD)					
Continuing operations	5.44	3.28	2.82	2.92	4.39
Discontinued operations				4.48	– 0.18
Total	5.44	3.28	2.82	7.40	4.21
Diluted earnings per share (USD)					
Continuing operations	5.38	3.25	2.80	2.88	4.31
Discontinued operations				4.41	– 0.18
Total	5.38	3.25	2.80	7.29	4.13
Cash dividends[2]	6 966	6 495	6 475	6 643	6 810
Cash dividends per share in CHF[3]	2.85	2.80	2.75	2.70	2.60
Personnel cost[4, 5]	15 651	13 932	13 681	13 540	14 569
Full-time equivalent associates at year-end[5]	125 161	121 597	118 393	118 700	117 809

[1] In 2015, Novartis completed a series of portfolio transformation transactions, including the divestments of its Animal Health and Vaccines business. In addition, a combined consumer healthcare business was created through the combination of the Novartis OTC and GlaxoSmithKline (GSK) Consumer Healthcare businesses. On March 2, 2015 a new entity, GlaxoSmithKline Consumer Healthcare Holdings Ltd. (GSK Consumer Healthcare) was formed via contribution of businesses from both Novartis and GSK. Novartis had a 36.5% interest in the newly created entity. To reflect these transactions, Novartis reported the Group's financial results for 2015 and 2014 as "continuing operations" and "discontinued operations", as required by IFRS.

[2] Cash dividends represent cash payments in the applicable year that generally relates to earnings of the previous year.

[3] Cash dividends per share represent dividends proposed that relate to earnings of the current year. Dividends for 2014 through 2017 were approved at the respective AGMs and dividends for 2018 will be proposed to the Annual General Meeting on February 28, 2019 for approval.

[4] Personnel cost include wages, salaries, allowances, commissions and bonuses to staff, overtime, awards, holiday pay, severance payments and social welfare expenses.

[5] Own employees

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	Year ended December 31,				
(USD millions)	2018	2017	2016	2015	2014
BALANCE SHEET DATA					
Cash, cash equivalents and marketable securities & derivative financial instruments	15 964	9 485	7 777	5 447	13 862
Inventories	6 956	6 867	6 255	6 226	6 093
Other current assets	11 836	11 856	10 899	11 172	10 805
Non-current assets	110 000	104 871	105 193	108 711	87 826
Assets of disposal group held for sale[1]	807				
Assets related to discontinued operations[2]					6 801
Total assets	145 563	133 079	130 124	131 556	125 387
Trade accounts payable	5 556	5 169	4 873	5 668	5 419
Other current liabilities	24 000	18 234	17 336	18 040	19 136
Non-current liabilities	37 264	35 449	33 024	30 726	27 570
Liabilities of disposal group held for sale[1]	51				
Liabilities related to discontinued operations[2]					2 418
Total liabilities	66 871	58 852	55 233	54 434	54 543
Issued share capital and reserves attributable to shareholders of Novartis AG	78 614	74 168	74 832	77 046	70 766
Non-controlling interests	78	59	59	76	78
Total equity	78 692	74 227	74 891	77 122	70 844
Total liabilities and equity	145 563	133 079	130 124	131 556	125 387
Net assets	78 692	74 227	74 891	77 122	70 844
Outstanding share capital	875	869	896	890	898
Total outstanding shares (millions)	2 311	2 317	2 374	2 374	2 399

[1] The disposal group held for sale relate to the assets and liabilities of the pending divestment of the Sandoz US dermatology business and generic US oral solids portfolio to Aurobindo Pharma USA Inc., as announced on September 6, 2018 (see “item 18. Financial Statements – Note 2 Significant pending transactions).
[2] A description of discontined operations can be found in footnote 1 of the table above.

Cash dividends per share
Cash dividends are translated into US dollars at the Bloomberg Market System Rate on the payment date. Because we pay dividends in Swiss francs, exchange rate fluctuations will affect the US dollar amounts received by holders of ADRs.

Year earned	Month and year paid	Total dividend per share (CHF)	Total dividend per share (USD)
2014	March 2015	2.60	2.67
2015	March 2016	2.70	2.70
2016	March 2017	2.75	2.72
2017	March 2018	2.80	2.94
2018 [1]	March 2019	2.85	2.89 [2]

[1] Dividend to be proposed at the Annual General Meeting on February 28, 2019 and to be distributed March 6, 2019
[2] Translated into US dollars at the December 31, 2018 rate of USD 1.014 to the Swiss franc. This translation is an example only, and should not be construed as a representation that the Swiss franc amount represents, or has been or could be

converted into US dollars at that or any other rate.

3.B Capitalization and indebtedness

Not applicable.

3.C Reasons for the offer and use of proceeds

Not applicable.

3.D Risk factors

Our businesses face significant risks and uncertainties. You should carefully consider all of the information set forth in this Annual Report and in other documents we file with or furnish to the SEC, including the Form 20-F filed with the SEC by our subsidiary Alcon Inc. in connection with our planned spin-off of the Alcon business, as well as the following risk factors, before deciding to invest in or to maintain an investment in any Novartis securities. Our business, as well as our financial condition or results of operations, could be materially adversely affected by any of these risks, as well as other risks and uncertainties not currently known to us or not currently considered material.

Risks facing our business

Our products face losses of intellectual property protection.

Major products of our Innovative Medicines Division, as well as certain products of our Sandoz and Alcon Divisions, are protected by patent and other intellectual property rights, which provide us with exclusive rights to market the products, and give us an opportunity to recoup our investments in research and development. However, the strength and duration of those intellectual property rights can vary significantly from product to product and country to country, and they may be successfully challenged by third parties or governmental authorities. Loss of market exclusivity for one or more important products has had, and can be expected to continue to have, a material adverse effect on our results of operations.

The introduction of generic competition for a patented branded medicine typically results in a significant and rapid reduction in net sales and operating income for the branded product because generic manufacturers typically offer their unpatented versions at sharply lower prices. Such competition can occur after successful challenges to intellectual property rights or the regular expiration of the term of the patent or other intellectual property rights. Such competition can also result from the entry of generic versions of another medicine in the same therapeutic class as one of our drugs or in another competing therapeutic class, from a Declaration of Public Interest or the compulsory licensing of our drugs by governments, or from a general weakening of intellectual property laws in certain countries around the world. In addition, generic manufacturers sometimes take an aggressive approach to challenging intellectual property rights, including conducting so-called “launches at risk” of products that are still under legal challenge for infringement, before final resolution of legal proceedings.

We also rely in all aspects of our businesses on unpatented proprietary technology, know how, trade secrets and other confidential information, which we seek to protect through various measures, including confidentiality agreements with licensees, employees, third-party collaborators, and consultants who may have access to such information. If these agreements are breached or our other protective measures should fail, then our contractual or other remedies may not be adequate to cover our losses.

Some of our best-selling products have begun or are about to face significant competition due to the end of market exclusivity resulting from the expiry of patent or other intellectual property protection.

• Our former top-selling products *Gleevec/Glivec, Diovan* and *Exforge* all face continued and increasing generic competition in major markets.

• Patent protection for the marketed forms of our *Sandostatin* products has expired. Generic versions of *Sandostatin* SC are available in the US, the EU and Japan. While there is currently no generic competition in the US, the EU or Japan for *Sandostatin* LAR, the long-acting version of *Sandostatin* that represents the majority of our *Sandostatin* sales, such generic competition may arise in the future.

• Intellectual property protecting a number of additional major products is either being challenged or will expire at various times in the coming years, raising the possibility of generic competition. Among these products that may begin to face generic competition in one or more major markets during the next three years are *Gilenya*, our everolimus products (*Afinitor/Votubia* and *Zortress/Certican*), *Exjade* and *Jadenu*, and *Lucentis*.

For more information on the patent and generic competition status of our Innovative Medicines Division’s products, see “Item 4. Information on the Company—Item 4.B Business overview—Innovative Medicines—Intellectual property.”

In 2019, we expect a potentially significant impact on our net sales from products that have already lost intellectual property protection, as well as products that will lose protection during the year. Because we typically have substantially reduced marketing and research and development expenses related to products that are in their final years of exclusivity, the initial loss of intellectual property protection for a product during the year could also have an impact on our 2019 operating income in an amount corresponding to a significant portion of the product’s lost sales.

The magnitude of the impact of generic competition on our income could depend on a number of factors, including the time of year at which the generic competitor is launched; the ease or difficulty of manufacturing a competitor product and obtaining regulatory approval to market it; the number of generic competitor products approved, including whether, in the US, a single competitor is granted an exclusive marketing period; whether an authorized generic is launched; the geographies in which generic competitor products are approved, including the strength of the market for generic pharmaceutical products in such geographies and the comparative profitability of branded

pharmaceutical products in such geographies; and our ability to successfully develop and launch profitable new products to replace the income lost to generic competition. See also "—Our research and development efforts may not succeed," below, with respect to the development and launch of new products.

Clearly, with respect to major products for which the patent terms are expiring, the loss of exclusivity of these products could have a material adverse effect on our business, financial condition, or results of operations. In addition, should we unexpectedly lose exclusivity on additional products as a result of patent litigation or other reasons, this could also have a material adverse effect on our business, financial condition, or results of operations, both due to the loss of revenue and earnings, and the difficulties in planning for such losses.

Our financial performance depends on the commercial success of key products.

Our financial performance, including our ability to replace revenue and income lost to generic and other competition and to grow our business, depends heavily on the commercial success of our products. If any of our major products were to become subject to problems such as changes in prescription growth rates, unexpected side effects, loss of intellectual property protection, supply chain issues or other product shortages, regulatory proceedings, changes in labeling, publicity affecting doctor or patient confidence in the product, material product liability litigation, or pressure from new or existing competitive products, the adverse impact on our revenue and profit could be significant. In addition, our revenue and profit could be significantly impacted by the timing and rate of commercial acceptance of key new products.

See also "—Our business is affected by pressures on pricing and reimbursement for our products," below, with regard to the impact of pricing and reimbursement issues on the commercial success of our products.

All of our businesses face intense competition from new products and technological advances from competitors, and physicians, patients and third-party payers may choose our competitors' products instead of ours if they perceive them to be safer, more effective, easier to administer, less expensive, more convenient or more cost-effective. Products that compete with ours are launched from time to time. We cannot predict with accuracy the timing of the introduction of such competitive products or their possible effect on our sales. However, products significantly competitive to our major products – including *Cosentyx, Lucentis, Gilenya, Sandostatin, Tasigna, Afinitor, Kisqali* and *Kymriah*– are on the market, and others are in development. In addition, numerous companies from around the world are seeking to enter the healthcare field to take advantage of their expertise in digital and other new technologies.

See "—We may fail to develop or take advantage of transformational technologies and business models," below.

Such competitive products could significantly affect the revenue from our products and our results of operations. This impact could also be compounded to the extent such competition results in us making significant additional investments in marketing and sales, or in research and development.

For example, our US Sandoz business has suffered significant declines in sales and profits in recent years due, at least in part, to increased competition in its product segments. There can be no certainty that Sandoz US sales will recover in the coming years. In any event, such competition and the costs of our efforts to improve the business's performance, as well as other factors, can be expected to affect the business, financial condition, or results of operations of this organization, at least in the near term. In addition, despite the devotion of significant resources to our efforts to improve the performance of Sandoz US, those efforts may ultimately prove insufficient. Should our efforts fail to accomplish their goals, or fail to do so in a timely manner, it could have a material adverse impact on our business, financial condition, or results of operations beyond the near term, as well.

See also "—Our research and development efforts may not succeed," and "—Competition and failure to successfully develop biosimilars and other differentiated products may impact the success of our Sandoz Division," below.

Our research and development efforts may not succeed.

We engage in extensive and costly research and development activities, both through our own dedicated resources and through collaborations with third parties, in an effort to identify and successfully and cost-effectively develop new products that address unmet and changing medical needs, are accepted by patients and physicians, are reimbursed by payers, and are commercially successful. Our ability to continue to maintain and grow our business; to replace sales lost due to competition, entry of generics or other reasons; and to bring to market products and medical advances that take advantage of new and potentially disruptive technologies, depends in significant part upon the success of these efforts. However, developing new healthcare products and bringing them to market is a highly costly, lengthy and uncertain process. In spite of our significant investments, there can be no guarantee that our research and development activities will produce commercially successful new products that will enable us to replace revenue and income lost to

generic and other competition and to grow our business. See also "—We may not successfully achieve our goals in transactions or reorganizations," below, with regard to our efforts to reorganize our Innovative Medicines product development organization.

Using the products of our Innovative Medicines Division as an example, the research and development process for a new product can take up to 15 years, or even longer, from discovery to commercial product launch – and with limited available intellectual property protections, the longer it takes to develop a product, the less time there may be for us to recoup our research and development costs. New products must undergo intensive preclinical and clinical testing, and must be approved by means of highly complex, lengthy and expensive approval processes that can vary from country to country.

During each stage, there is a substantial risk that we will encounter serious obstacles that will further delay us and add substantial expense, that we will develop a

product with limited potential for commercial success, or that we will be forced to abandon a product in which we have invested substantial amounts of time and money. These risks may include failure of the product candidate in preclinical studies, difficulty enrolling patients in clinical trials, clinical trial holds or other delays in completing clinical trials, insufficient clinical trial data to support the safety or efficacy of the product candidate or to differentiate our product candidate from competitors, delays in completing formulation and other testing and work necessary to support an application for regulatory approval, adverse reactions to the product candidate or other safety concerns, an inability to manufacture sufficient quantities of the product candidate for development or commercialization activities in a timely and cost-effective manner, and failure to obtain, or delays in obtaining, the required regulatory approvals for the product candidate or the facilities in which it is manufactured.

In addition, following the "Brexit" vote in the UK, the EU decided to move the headquarters of the EU's health authority, the EMA, from the UK to the Netherlands by March 2019. It is expected that a significant percentage of the current employees of the EMA will decide not to make the move to the Netherlands. This raises the possibility that new drug approvals in the EU could be delayed as a result.

Further, in recent years, in order to achieve approvals of new products and new indications, governmental authorities around the world have increasingly required more clinical trial data than they had in the past, the inclusion of significantly higher numbers of patients in clinical trials, and more detailed analyses of the trials. In addition, in order for a product to be reimbursed and to be commercially successful, payers and prescribers have increasingly required additional data that differentiates the product from other drugs on the market. As a result, despite significant efforts by health authorities such as the FDA to accelerate the development of new drugs, the already lengthy and expensive process of obtaining regulatory approvals and reimbursement for pharmaceutical products has in many cases become even more challenging.

Similarly, the post-approval regulatory burden has also increased. Approved drugs are subject to various requirements such as risk evaluation and mitigation strategies (REMS), risk management plans, comparative effectiveness studies, health technology assessments, and requirements to conduct post-approval Phase IV clinical trials to gather additional safety and other data on products. These requirements have the effect of making the maintenance of regulatory approvals for our products increasingly expensive, and further heightening the risk of recalls, product withdrawals, loss of market share, and loss of revenue and profitability.

There is also the risk that we may fail to identify significant new product candidates for development or potentially disruptive new technologies, and so may fail to take advantage of a potential new wave of innovation.

Our Alcon Division faces similar challenges in bringing new products to market, including both the products and components that have been developed in house, as well as those that have been acquired from third parties. Alcon's Surgical and Vision Care products face medical device development and approval processes that are often similarly as difficult as those faced by our Innovative Medicines Division. For example, in 2017 the EU published a new EU Medical Devices Regulation, which has introduced substantial changes to the requirements for medical device manufacturers bringing new products to the EU market, including with respect to clinical development, labeling, technical documentation and quality management systems. The regulation has a three-year implementation period. Further, the FDA is also pursuing various efforts to modernize its regulation of devices, including potential changes to existing regulatory approval pathways that could impact our device approval efforts. Alcon has taken steps to increase its innovation power and the success of its research and development efforts. But these efforts are costly and require extensive efforts over time. There can be no certainty that Alcon will be successful in these efforts, in either the short term or the long term, and if Alcon is not successful, there could be a material adverse effect on the success of the Alcon Division.

In addition, our Sandoz Division has made, and expects to continue to make, significant investments in the development of biotechnology-based, "biologic" medicines intended for sale as bioequivalent or "biosimilar" versions of currently marketed biotechnology products, as well as other differentiated, "difficult-to-make" generic products. While the development of such products typically is significantly less costly and complex than the development of the equivalent originator medicines, it is nonetheless often significantly more costly and complex than that for non-differentiated generic products. In addition, many countries do not yet have fully developed legislative or regulatory pathways to facilitate the development of biosimilars and permit biosimilars to be sold in a manner in which the biosimilar product would be readily substitutable for the originator product. Further delays in the development and completion of such regulatory pathways, or any significant impediments that may ultimately be built

into such pathways, or any other significant difficulties that may arise in the development or marketing of biosimilars or other differentiated products, could put at risk the significant investments that Sandoz has made, and will continue to make, in the development of differentiated products in general, and in its Biopharmaceuticals business in particular. Sandoz also achieves significant revenue opportunities when it secures and maintains exclusivity periods granted for generic products in certain markets – particularly the 180-day exclusivity period granted in the US by the Hatch Waxman Act for first-to-file generics. Failure to obtain and maintain such exclusivity periods or to successfully develop and market biosimilars and differentiated generic products could have a material adverse effect on the success of the Sandoz Division and the Group as a whole.

See also "—Competition and failure to successfully develop biosimilars and other differentiated products may impact the success of our Sandoz Division," below.

Further, in all of our divisions, our research and development activities must be conducted in an ethical and compliant manner. Among other things, we must be concerned with patient safety, data privacy, Good Clinical Practices requirements, data integrity requirements, the fair treatment of patients in developing countries, and animal welfare requirements. Should we fail to properly

manage such issues, we risk injury to third parties, damage to our reputation, negative financial consequences as a result of potential claims for damages, sanctions and fines, and the potential that our investments in research and development activities could have no benefit to the Group.

If we are unable to maintain a flow of successful, cost-effective new products and new indications for existing products that will sustain and grow our business, cover our substantial research and development costs and the decline in sales of older products that become subject to generic or other competition, and take advantage of technological and medical advances, then this could have a material adverse effect on our business, financial condition, or results of operations.

For a further description of the approval processes that must be followed to market our products, see the sections headed "Regulation" included in the descriptions of our operating divisions under "Item 4. Information on the Company—Item 4.B Business overview."

Our business is affected by pressures on pricing and reimbursement for our products.

Our businesses are operating in an ever more challenging environment, with significant pressures on the pricing of our products and on our ability to obtain and maintain satisfactory rates of reimbursement for our products by governments, insurers and other payers. The growth of overall healthcare costs as a percentage of gross domestic product in many countries means that governments and payers are under intense pressure to control healthcare spending even more tightly than in the past. These pressures are particularly strong given the increasing demand for healthcare resulting from the aging of the global population and associated increases in noncommunicable diseases, and the resulting impact on healthcare budgets. These pressures are further compounded by significant controversies and intense political debate and publicity about prices for pharmaceuticals that some consider excessive, including government regulatory efforts, funding restrictions, legislative proposals, policy interpretations, investigations and legal proceedings regarding pharmaceutical pricing practices.

See also "—Ongoing consolidation among our distributors and retailers is increasing both the purchasing leverage of key customers and the concentration of credit risk," below, with regard to the impact of the consolidation among our customers on our pricing; "—Our products face losses of intellectual property protection," above, with regard to the impact of the loss or risk of loss of intellectual property protections on our pricing; and "—Political and economic instability may impact our results," below, with regard to the impact of economic conditions on our pricing.

As a result, in addition to ongoing public and political pressures to limit the prices we charge for our products, we face numerous cost-containment measures imposed by governments and other payers, including government-imposed industrywide price reductions, mandatory pricing systems, reference pricing systems, payers limiting access to treatments based on cost-benefit analyses, imports of drugs from lower-cost countries to higher-cost countries, shifting of the payment burden to patients through higher co-payments, limiting physicians' ability to choose among competing medicines, mandatory substitution of generic drugs for the patented equivalent, growing pressure on physicians to reduce the prescribing of patented prescription medicines, increasing pressure on intellectual property protections, and requirements for increased transparency on pricing. For more information on such price controls, see "Item 4. Information on the Company—Item 4.B Business overview—Innovative Medicines—Price controls."

We expect these challenges to continue and to increase in 2019 and following years as political pressures mount, and healthcare payers around the globe, including government-controlled health authorities, insurance companies and managed care organizations, step up initiatives to reduce the overall cost of healthcare, restrict access to higher-priced new medicines, increase the use of generics and impose overall price cuts. These factors may materially affect our ability to achieve an acceptable return on our investments in the research and development of our products, may impact our ability to invest in the research and development of new products, and could have a material adverse impact on our business, financial condition, or results of operations, as well as on our reputation.

We could be impacted by new laws and regulations, and by failures to comply with law, legal proceedings and government investigations.

We are obligated to comply with the laws of all of the countries around the world in which we operate and sell products with respect to an extremely wide and growing range of activities. Such legal requirements can vary from country to country, and new requirements may be imposed on us from time to time as a result of changing government and public expectations regarding the healthcare industry, and acceptable corporate behavior generally.

For example, we are faced with increasing pressures, including new laws and regulations from around the world, to be more transparent with respect to how we do business, including with respect to our interactions with healthcare

professionals and organizations. These laws and regulations include requirements that we disclose payments or other transfers of value made to healthcare professionals and organizations, as well as information relating to the prices for our products. Such measures, including any additional such measures that may be put in place, could have a material adverse impact on our business, financial condition, or results of operations.

In addition, companies and executives in our industry continue to face significant government investigations, legal proceedings and law enforcement activities, both in the US and in countries around the world. Increasingly, such activities can involve criminal proceedings, and can retroactively challenge practices previously considered to be legal. A number of our subsidiaries across each of our divisions are, or may in the future be, subject to various investigations and legal proceedings,

including proceedings regarding sales and marketing practices, pricing, corruption, trade regulation and embargo legislation, product liability, commercial disputes, employment and wrongful discharge, antitrust matters, securities, insider trading, occupational health and safety, environmental matters, tax, cybersecurity, data privacy and intellectual property.

Our Sandoz Division may from time to time seek approval to market a generic version of a product before the expiration of patents claimed by the marketer of the patented product. We do this in cases where we believe that the relevant patents are invalid or unenforceable, or would not be infringed by our generic product. As a result, affiliates of our Sandoz Division frequently face patent litigation, and in certain circumstances, we may elect to market a generic product even though patent infringement actions are still pending. Should we elect to proceed in this manner and conduct a "launch at risk," we could face substantial damages if the final court decision is adverse to us.

For information on significant legal matters pending against us, see "Item 18. Financial Statements—Note 19. Provisions and other non-current liabilities" and "Item 18. Financial Statements—Note 27. Commitments and contingencies." See also "—Our reliance on outsourcing key business functions to third parties heightens the risks faced by our businesses," below.

To help us in our efforts to comply with the many requirements that impact us, we have a significant global ethics and compliance program in place, and we devote substantial time and resources to efforts to ensure that our business is conducted in a lawful and publicly acceptable manner. Nonetheless, despite our efforts, any actual or alleged failure to comply with law or with heightened public expectations could lead to substantial liabilities that may not be covered by insurance, or to other significant losses, and could affect our business, financial position and reputation.

Such proceedings are inherently unpredictable, and large judgments sometimes occur. As a consequence, we may in the future incur judgments that could involve large cash payments, including the potential repayment of amounts allegedly obtained improperly, and other penalties, including treble damages. In addition, such legal proceedings and investigations, even if meritless, may affect our reputation, may create a risk of potential exclusion from government reimbursement programs in the US and other countries, and may lead to civil litigation. As a result, having taken into account all relevant factors, we have in the past and may again in the future enter into major settlements of such claims without bringing them to final legal adjudication by courts or other such bodies, despite having potentially significant defenses against them, in order to limit the risks they pose to our business and reputation. Such settlements may require us to pay significant sums of money and to enter into corporate integrity or similar agreements, which are intended to regulate company behavior for extended periods.

Any such judgments or settlements, and any accruals that we may take with respect to potential judgments or settlements, could have a material adverse impact on our business, financial condition, or results of operations, as well as on our reputation.

The manufacture of our products is highly regulated and complex.

The manufacture of our products is complex and heavily regulated by governmental health authorities around the world, including the FDA. Whether our products and the related raw materials are manufactured at our own dedicated manufacturing facilities or by third parties, we must ensure that all manufacturing processes comply with our own quality standards, as well as with current Good Manufacturing Practices (cGMP) and other applicable regulations.

The technically complex manufacturing processes required to manufacture many of our products increase the risk of production failures and product recalls, and can increase the cost of producing our goods. Many of our products require a supply of highly specialized raw materials. For some of our products and raw materials, we may rely on a single source of supply. In addition, we manufacture and sell a number of sterile products, biologic products and products involving advanced therapy platforms, such as CAR-T therapies, gene therapy and radioligand therapy products, all of which are particularly complex and involve highly specialized manufacturing technologies. As a result, even slight deviations at any point in their production process or in material used may lead to production failures or recalls. For example, for our new CAR-T therapy product *Kymriah,* manufacturing-related issues have impacted the product's sales. In sum, because the production process for some of our products is complex and sensitive, the cost of production of these products can be high, and the chance of production failures, lengthy supply interruptions, product recalls or voluntary market withdrawals is increased.

In addition, due to the inherent complexities of our production processes, we are required to plan our production activities well in advance. If we should suffer from raw material shortages, or if we should underestimate market demand for a product, or should fail to accurately predict when the product would be approved for sale, then we may not be able to produce sufficient product to meet demand. Alternatively, if we overestimate the quantity or timing of

product to be produced, then we may be required to dispose of excess product, which would result not only in the loss of the product but also in the resources spent to produce it.

These complex production processes are also heavily regulated by health authorities around the world. And in recent years, these health authorities have substantially intensified their scrutiny of manufacturers' compliance with such requirements. Any significant failure by us or our third-party suppliers to comply with these requirements, or with the health authorities' expectations, may cause us to shut down the production facilities or production lines and recall previously shipped products. Alternatively, we may be forced to do so by a government health authority, or could be prevented from importing our products from one country to another. In addition, health authorities have in some cases imposed significant penalties for such failures to comply with cGMP. A failure to comply fully with cGMP could also lead to a delay in the approval of new products to be manufactured at the impacted site.

Further, because our products are intended to promote the health of patients, for some of our products, a

supply disruption or other production issue could endanger our reputation and subject us to lawsuits or to allegations that the public health, or the health of individuals, has been harmed.

In sum, complex production processes and compliance with regulatory requirements can increase our cost of producing our products, and any significant disruption in the supply of our products could impact patient health and our sales, which could have a material adverse effect on our business, financial condition, or results of operations, as well as our reputation.

See also "—We may not successfully achieve our goals in transactions or reorganizations," below, with regard to our efforts to reorganize our product manufacturing organization, and "—Climate change, extreme weather events, earthquakes and other natural disasters could adversely affect our business," below.

We devote substantial time and resources to meeting these challenges. However, there can be no guarantee as to the success of our efforts, or that we or our third-party suppliers will not face significant manufacturing issues, or that we will successfully manage such issues when they arise. Such issues could lead to shutdowns, to product shortages, or to our being entirely unable to supply products to patients for an extended period of time. Such shortages or shutdowns have led to, and could continue to lead to, significant losses of sales revenue and to potential third-party litigation.

We may not successfully achieve our goals in transactions or reorganizations.

As part of our strategy, from time to time we acquire and divest products or entire businesses in order to expand or complement our existing businesses, or to enable us to focus more sharply on our strategic businesses. For example, we recently completed the acquisitions of AveXis, Inc., a gene therapy company, and Endocyte, Inc., a radioligand therapy company, as well as the divestment of our stake in the GSK consumer healthcare joint venture. We also announced plans to spin off our Alcon Division and to divest the Sandoz US dermatology business and US oral solids portfolio.

Despite expending significant efforts and resources in this area, we cannot ensure that we will identify products or businesses that are suitable for acquisition. In addition, acquisition activities can be thwarted by governmental regulation, including market concentration limitations, political interference, overtures from competitors for the targeted assets, potentially increasing prices demanded by sellers, and other issues. Once an acquisition is agreed upon with a third party, we may not be able to complete the acquisition in the expected form or within the expected timeframe, or at all, due to a failure to obtain required regulatory approvals or a failure to achieve contractual or other required closing conditions. Further, after an acquisition, efforts to develop and market acquired products or to integrate the acquired business may not meet expectations, or may otherwise not be successful, as a result of difficulties in retaining key personnel, customers and suppliers; difference in corporate culture, standards, controls, processes and policies; the price at which we acquired the business; or other reasons. Acquisitions and divestments can also divert management's attention from our existing businesses, and could result in the existing businesses failing to achieve expected results, or in liabilities being incurred that were not known at the time of acquisition, or the creation of tax or accounting issues.

Similarly, we cannot ensure that we will be able to successfully divest or spin off businesses or other assets that we have identified for this purpose. Neither can we ensure that we will correctly select businesses or assets as candidates for divestment or spin-off, that we will be able to successfully complete any planned divestments or spin-offs, or that any completed divestment or spin-off will achieve the expected strategic benefits, synergies or opportunities, or that the divestment or spin-off will ultimately maximize shareholder value.

In addition, as part of our strategy, from time to time we reassess the optimal organization of our business, such as our ongoing efforts to centralize and optimize our manufacturing and business services organizations, in order to better align our organization with the capabilities and expertise required for competitive advantage. But the expected benefits of such reorganizations may never be fully realized or may take longer to realize than expected. There can be no certainty that the businesses and functions involved will be successfully integrated into the new organizations or that key personnel will be retained. Disruption from the reorganizations may make it more difficult to maintain relationships with customers, employees or suppliers; could result in shortfalls in program oversight; and may result in the Group not achieving the expected productivity and financial benefits.

Both with respect to the transactions and reorganizations previously announced, and to potential future transactions and reorganizations, if we fail to successfully address these risks, or to devote adequate resources to them, we may fail to achieve our strategic objectives, including our growth strategy, or otherwise may not realize the intended benefits of the acquisition, divestiture, spin-off or reorganization.

Significant breaches of information security and the use of electronic communications technologies could adversely affect our business and expose people's personal information.

We are heavily dependent on critical, complex and interdependent information technology systems, including internet-based systems, to support our business processes. In addition, we rely on internet and social media tools and mobile technologies as a means of communications and to gather information, which can include people's personal data. We also increasingly seek to develop technology-based products such as mobile applications and other digital health products that go "beyond the pill" to improve patient welfare in a variety of ways, which could also result in us collecting personal information about individual patients and others.

The size, age and complexity of our information technology systems make them potentially vulnerable to external and internal security threats; outages; malicious intrusions and attacks; cybercrimes, including state-sponsored cybercrimes; malware; misplaced or lost data; programming or human errors; or other similar events. Although we have devoted and continue to devote significant resources and management attention to cybersecurity, information management and business

continuity efforts, like many companies, we have experienced certain of these events and expect to continue to experience them in the future, as the external and internal information security threat continues to grow. We believe that the information security incidents we have experienced to date have yet to result in significant disruptions to our operations, and have not had a significant adverse effect on our results of operations, or on third parties. However, we may not be able to prevent future outages, security incidents or other breaches in our systems from having a material adverse effect on our business, financial condition, results of operations, or reputation.

A significant information security or other such event could negatively impact important business processes, such as the conduct of scientific research and clinical trials, the submission of the results of such efforts to health authorities in support of requests for product approvals, the functioning of our manufacturing and supply chain processes, our compliance with legal obligations, communication between employees and with third parties, and other key business activities. Information technology issues could also lead to the compromise of trade secrets or other intellectual property that could be sold and used by competitors to accelerate the development or manufacturing of competing products; to the compromise of personal financial and health information that could be misused for fraud and identity theft; and to the compromise of information technology security data such as usernames, passwords and encryption keys, as well as security strategies and information about network infrastructure, which could allow unauthorized parties to gain access to additional information on our systems. In addition, malfunctions in software or medical devices that make significant use of information technology, including our Alcon surgical equipment, could lead to a risk of direct harm to patients.

In addition, our routine business operations increasingly involve our gathering personal information (including sensitive personal information) about patients, vendors, customers, employees, collaborators and others, through the use of information technologies such as the internet, social media, mobile technologies and technology-based medical devices. Breaches of our systems or those of our third-party contractors, or other failures to protect such information, could expose such people’s personal data to unauthorized persons. Any event involving the substantial loss of personal data could give rise to significant liability, reputational harm, damaged relationships with business partners, and potentially substantial monetary penalties under laws enacted or being enacted around the world. Such events could also lead to restrictions on our ability to transfer personal data across country borders.

We also use internet, social media and mobile tools as a means to communicate with the public, including about our products or about the diseases our products are intended to treat. However, such uses create risks, such as potential violations of rules regulating the promotion of prescription medicines and the potential loss of trade secrets or other intellectual property. In addition, there continues to be significant uncertainties as to the rules that apply to such communications, and as to the interpretations that health authorities will apply in this context to the rules that do exist. As a result, despite our efforts to comply with applicable rules, there is a significant risk that our use of internet, social media and mobile technologies for such purposes may cause us to nonetheless be found in violation of them.

Our dependence upon information technology, including any breaches of data security, technology disruptions, privacy violations, or other impacts from the use of interconnected technologies, could give rise to the loss of trade secrets or other intellectual property, to the public exposure of personal information, and to interruptions to our operations, and could result in enforcement actions or liability, including potential government fines, claims for damages, and shareholders’ litigation. Any significant events of this type could require us to expend significant resources beyond those we already invest to remediate any damage, to further modify or enhance our protective measures, and to enable the continuity of our business, and could have a material adverse effect on our business, financial condition, results of operations, and reputation.

We may fail to develop or take advantage of transformational technologies and business models.

Rapid progress in medical and digital technologies and in the development of sometimes radical new business models is substantially transforming numerous industries around the world, creating new businesses and new opportunities for revenue and profit, while sometimes quickly rendering established businesses uncompetitive or obsolete. Such transformations, both positive and negative, may impact the healthcare industry, and numerous companies from the digital technology and other industries are seeking to enter the healthcare field.

To take advantage of these opportunities, Novartis has embarked upon a digital transformation strategy, with the goal of making Novartis an industry leader in leveraging advanced analytics and other new technologies. As part of this effort, we have created a new role of Chief Digital Officer, reporting directly to the CEO, charged with creating and executing a Companywide digital strategy, to be led by the Executive Committee of Novartis.

In order to reach our goal, we expect to invest substantial resources into efforts to improve the way we use data in drug discovery and development; to improve the ways we engage with patients, doctors and other stakeholders; and to automate business processes. With our commitment to using innovative science and digital technologies to help create transformative treatments for patients, together with our expertise and the extensive data we have and continue to amass, we believe that we have an opportunity to transform our business model using digital technologies.

There is no guarantee that our efforts toward a digital transformation will succeed, or that we will successfully transform our business model, or that we will be able to do so at any particular cost or any particular time. In order to succeed, we will be required to encourage a cultural change among our employees, attract and retain employees with appropriate skills and mindset, and successfully innovate across a variety of technology fields.

At the same time, other companies with specialized expertise or business models are entering the

healthcare field, from research and development to pharmaceutical distribution, potentially disrupting our relationships with patients, healthcare professionals, customers, distributors and suppliers, with unknown potential consequences for us. For example, companies such as Amazon, which acquired PillPack; IBM, with its Watson project; Alphabet, with its subsidiaries Verily and Calico; and Amazon, Berkshire Hathaway and JPMorgan, with their healthcare joint venture, as well as other established technology companies and specialized startup organizations, are aggressively seeking to move forward in this field. In addition, we face new competitors from different regions of the world, including China, which is moving aggressively to expand its role in the sciences and in many industries. Such new competitors may successfully impact our share of the healthcare value chain, or even develop products or technologies that could make our products uncompetitive or obsolete.

In an effort to maintain and advance our position as a leader in healthcare and related technology, we have made significant efforts to develop and to collaborate with other organizations in the development of advanced therapy platforms, including CAR-T therapy, developed in collaboration with the University of Pennsylvania; gene therapy, through our acquisition of AveXis and the licensing of *Luxturna* outside the US from Spark Therapeutics; and radioligand therapy, through our acquisitions of Advanced Accelerator Applications and Endocyte, Inc.

If we should fail in our efforts at a digital transformation of our Company, or in bringing advanced therapy platforms to market, then there is a risk that we may fail to create the innovative new products, tools or techniques that the new medical and digital technologies may make possible, or may fail to create them as quickly and efficiently as such technologies may enable. We may also lose opportunities to engage with our stakeholders and to profit from improved business processes, and may lose the resources devoted to these efforts to transform our business. At the same time, should third parties successfully enter the healthcare field with disruptive new technologies or business models, then we potentially may see our business supplanted in whole or in part by these new entrants. Any such events could have a material adverse effect on our business, financial condition, or results of operations.

Environmental, social and governance matters may impact our business and reputation.

Increasingly, in addition to the importance of their financial performance, companies are being judged by their performance on a variety of environmental, social and governance (ESG) matters, which are considered to contribute to the long-term sustainability of companies' performance.

A variety of organizations measure the performance of companies on such ESG topics, and the results of these assessments are widely publicized, including, for example, MSCI, Sustainalytics, the Dow Jones Sustainability Index and, in the healthcare industry, the Access to Medicine Index. In addition, investment in funds that specialize in companies that perform well in such assessments are increasingly popular, and major institutional investors, such as BlackRock, have publicly emphasized the importance of such ESG measures to their investment decisions. Topics taken into account in such assessments include the company's efforts and impacts on climate change and human rights, ethics and compliance with law, and the role of the company's board of directors in supervising various sustainability issues. In addition to the topics typically considered in such assessments, in our healthcare industry, issues of the public's ability to access our medicines are of particular importance.

We actively manage a broad range of such ESG matters, taking into consideration their expected impact on the sustainability of our business over time, and on the potential impact of our business on society. For a description of our activities on such topics, see "Item 4. Information on the Company—Item 4.B Business overview—Overview—Corporate responsibility." However, in a rapidly changing world, there can be no certainty that we will manage such issues successfully, or that we will successfully meet society's expectations as to our proper role. Any failure or perceived failure by us in this regard could have a material adverse effect on our reputation and on our business, financial condition, or results of operations, including the sustainability of our business over time.

See also "—Our reliance on outsourcing key business functions to third parties heightens the risks faced by our businesses," and "—Climate change, extreme weather events, earthquakes and other natural disasters could adversely affect our business," below.

Intangible assets and goodwill on our books may lead to significant impairment charges.

We carry a significant amount of goodwill and other intangible assets on our consolidated balance sheet, primarily due to acquisitions, including, in particular, substantial goodwill and other intangible assets obtained as a result of our acquisitions of Alcon and of certain oncology assets from GSK. As a result, we may incur significant impairment charges in the future if the fair value of the intangible assets and the groupings of cash-generating units containing goodwill would be less than their carrying value on the Group's consolidated balance sheet at any point in time.

We regularly review for impairment our long-lived intangible and tangible assets, including identifiable intangible assets, investments in associated companies, and goodwill. Goodwill, intangible assets with an indefinite useful life, acquired research projects not ready for use, and acquired development projects not yet ready for use are subject to impairment review at least annually. Other long-lived assets are reviewed for impairment when there is an indication that an impairment may have occurred. Impairment testing under IFRS may lead to impairment charges in the future. Any significant impairment charges could have a material adverse effect on our results of operations and financial condition. In 2018, for example, we recorded intangible asset impairment charges of USD 1.2 billion.

For a detailed discussion of how we determine whether an impairment has occurred, what factors could result in an impairment, and the impact of impairment charges on our results of operations, see “Item 5. Operating and Financial Review and Prospects—Item 5.A Operating results—Critical accounting policies and

estimates—Impairment of goodwill, intangible assets and property, plant and equipment" and "Item 18. Financial Statements—Note 1. Significant accounting policies" and "Item 18. Financial Statements—Note 10. Goodwill and intangible assets."

Political and economic instability may impact our results.

Unpredictable political conditions currently exist in various parts of the world, including a backlash in certain areas against free trade, anti-immigrant sentiment, social unrest, fears of terrorism, and the risk of direct conflicts between nations. In the US, the presidential administration's imposition of tariffs and opposition to free-trade agreements could have a negative impact on international trade. Similarly, there is a risk that barriers to free trade and the free movement of people may rise in Europe as a result of the UK's "Brexit" efforts and the rise of nationalist, separatist and populist sentiment in various countries, sometimes exacerbated by large-scale migration flows. Furthermore, significant conflicts continue in parts of the Middle East, including conflicts involving Saudi Arabia and Iran, and with respect to places such as Russia, Ukraine and North Korea. Collectively, such difficult conditions could, among other things, disturb the international flow of goods and increase the costs and difficulties of international transactions.

In addition, local economic conditions may adversely affect the ability of payers, as well as our distributors, customers, suppliers and service providers, to pay for our products, or otherwise to buy necessary inventory or raw materials, and to perform their obligations under agreements with us. Although we make efforts to monitor these third parties' financial condition and their liquidity, our ability to do so is limited, and some of them may become unable to pay their bills in a timely manner, or may even become insolvent, which could negatively impact our business or results of operations. These risks may be elevated with respect to our interactions with fiscally challenged government payers, or with third parties with substantial exposure to such payers. See also "—Our reliance on outsourcing key business functions to third parties heightens the risks faced by our businesses," below.

Financial market issues may also result in a lower return on our financial investments, and a lower value on some of our assets. Alternatively, inflation could accelerate, which could lead to higher interest rates, increasing our costs of raising capital. Uncertainties around future central bank and other economic policies in the US and EU, as well as high debt levels in certain other countries, could also impact world trade. Sudden increases in economic, currency or financial market volatility in different countries have also impacted, and may continue to unpredictably impact, our business or results of operations, including the conversion of our operating results into our reporting currency, the US dollar, as well as the value of our investments in our pension plans.

For further information on such risks, see "—Foreign exchange fluctuations may adversely affect our earnings and the value of some of our assets," and "—Any inaccuracy in the assumptions and estimates used to calculate our pension plan obligations could substantially increase our pension-related expenses," below. See also "—Our business is affected by pressures on pricing and reimbursement for our products," above, and "Item 5. Operating and Financial Review and Prospects—Item 5.B Liquidity and capital resources—Effects of currency fluctuations."

There is also a risk that countries facing local financial difficulties, including countries experiencing high inflation rates and highly indebted countries facing large capital outflows, may impose controls on the exchange of foreign currency. Such exchange controls could limit our ability to distribute retained earnings from our local affiliates, or to pay intercompany payables due from those countries.

See also "Item 5. Operating and Financial Review and Prospects—Item 5.B Liquidity and capital resources—Condensed consolidated balance sheets," and "Item 18. Financial Statements—Note 14. Trade receivables" and "Item 18. Financial Statements—Note 28. Financial instruments—additional disclosures."

Similarly, increased scrutiny of corporate taxes and executive pay may lead to significant business disruptions or other adverse business conditions, and may interfere with our ability to attract and retain qualified personnel. See "—Changes in tax laws or their application could adversely affect our results of operations" and "—An inability to attract and retain qualified personnel could adversely affect our business," below.

To the extent that economic and financial conditions directly affect consumers, then our Innovative Medicines and Sandoz Divisions may be impacted. Given the requirements in certain countries that patients directly pay an increasingly large contribution toward their own healthcare costs, there is a risk that consumers may cut back on prescription drugs to help cope with rising costs. In addition, the elective surgical and contact lens businesses of our Alcon Division may be particularly sensitive to declines in consumer spending.

At the same time, significant changes and potential future volatility in the financial markets, in the consumer and business environment, in the competitive landscape, and in the global political and security landscape make it

increasingly difficult for us to predict our revenues and earnings into the future. As a result, any revenue or earnings guidance or outlook that we have given or might give may be overtaken by events, or may otherwise turn out to be inaccurate. Though we endeavor to give reasonable estimates of future revenues and earnings at the time we give such guidance, based on then-current knowledge and conditions, there is a significant risk that such guidance or outlook will turn out to be, or to have been, incorrect.

Separately and collectively, such factors may have a material adverse effect on our revenues, results of operations, financial condition and, if circumstances worsen, our ability to raise capital at reasonable rates.

Our indebtedness could adversely affect our operations.

As of December 31, 2018, we had USD 22.5 billion of non-current financial debt and USD 9.7 billion of current

financial debt. Our current and long-term debt requires us to dedicate a portion of our cash flow to service interest and principal payments and, if interest rates rise, this amount may increase. As a result, our existing debt may limit our ability to use our cash flow to fund capital expenditures, to engage in transactions, or to meet other capital needs, or otherwise may place us at a competitive disadvantage relative to competitors that have less debt. Our debt could also limit our flexibility to plan for and react to changes in our business or industry, and increase our vulnerability to general adverse economic and industry conditions, including changes in interest rates or a downturn in our business or the economy. We may also have difficulty refinancing our existing debt or incurring new debt on terms that we would consider to be commercially reasonable, if at all.

Our reliance on outsourcing key business functions to third parties heightens the risks faced by our businesses.

We outsource the performance of certain key business functions to third parties, and invest a significant amount of effort and resources into doing so. Such outsourced functions can include research and development collaborations, manufacturing operations, warehousing and distribution activities, certain finance functions, marketing activities, data management and others. We may particularly rely on third parties in developing countries, including for the sales, marketing and distribution of our products, and to obtain the intermediate and raw materials used in the manufacture of our products.

Our reliance on outsourcing and third parties for the research and development or manufacturing of our products may reduce the potential profitability of such products.

In addition, governments and the public are increasingly placing pressure on major corporations, including Novartis, to take responsibility for compliance with human rights and appropriate environmental practices, as well as other actions, of their third-party contractors around the world. Examples of this include the Conflict Minerals rule in the US, and the UK Modern Slavery Act.

We place strict contractual requirements on such contractors to comply with law and with our high standards. We also expend significant resources on efforts to screen out inappropriate contractors, to monitor the activities of those we have retained, and to seek their compliance with the law and with our expectations. Nonetheless, many of these companies have limited resources, and, in particular, do not have internal compliance resources comparable to those within our organization.

Ultimately, if the third parties fail to meet their obligations to us, we may lose our investment in the collaborations and fail to receive the expected benefits. In addition, should any of these third parties fail to comply with the law or should they act inappropriately in the course of their performance of services for us, there is a risk that we could be held responsible for their acts, that our reputation may suffer, and that penalties may be imposed upon us. Any such failures by third parties could have a material adverse effect on our business, financial condition, results of operations, or reputation.

Competition and failure to successfully develop biosimilars and other differentiated products may impact the success of our Sandoz Division.

Our Sandoz Division faces intense competition from companies that market patented pharmaceutical products, which sometimes take aggressive steps to delay the introduction of generic and biosimilar medicines, to limit the availability of exclusivity periods or to reduce their value. At the same time, Sandoz faces strong competition from other generic and biosimilar pharmaceutical companies, which aggressively compete for market share, including through significant price competition. Such competitive actions by other patented, generic and biosimilar pharmaceutical manufacturers may increase the costs and risks associated with our efforts to introduce and market such products, may delay the introduction or marketing of such products, and may further limit the prices at which we are able to sell these products and impact our results of operations. In particular, in the US in recent years, industrywide price competition among generic pharmaceutical companies and consolidation of buyers have significantly hurt Sandoz sales. Expecting these trends to continue, we agreed to sell the Sandoz US dermatology business and generic US oral solids portfolio to Aurobindo Pharma USA Inc.

In addition, Sandoz has invested heavily in the development of biosimilar drugs and other differentiated products, with the expectation that such products offer the potential for higher profitability than less complex products. Sandoz has invested in the development of such products despite the fact that their development is more difficult and expensive than the development of standard generic drugs, and despite the fact that regulations concerning the approval, marketing and sale of biosimilars in certain countries, including in the US, are still under development or not entirely clear. If Sandoz should fail in its efforts to develop and market biosimilars or other such differentiated

products, or if the developing biosimilars regulations do not ultimately favor the development and sale of such products, or if we are unable to sell our biosimilar products for a sufficient price, then this could have an adverse effect on the success of our Sandoz Division, and we may fail to achieve expected returns on the investments by Sandoz in the development of biosimilars and other differentiated products.

See also "—Our research and development efforts may not succeed" above, with regard to the risks involved in our efforts to develop biosimilars and differentiated generic products and to obtain exclusivity periods; and "—Ongoing consolidation among our distributors and retailers is increasing both the purchasing leverage of key customers and the concentration of credit risk," below, with respect to the impact of such consolidation on our pricing.

Any inaccuracy in the assumptions and estimates used to calculate our pension plan and other post-employment obligations could substantially increase our pension-related expenses.

We sponsor pension and other post-employment benefit plans in various forms. These plans cover a significant portion of our current and former associates. While most of our plans are now defined contribution plans, certain of our associates remain participants in defined benefits

plans. For these defined benefits plans, we are required to make significant assumptions and estimates about future events in calculating the present value of expected future plan expenses and liabilities. These include assumptions used to determine the discount rates we apply to estimated future liabilities and rates of future compensation increases. Assumptions and estimates used by Novartis may differ materially from the actual results we experience in the future, due to changing market and economic conditions, higher or lower withdrawal rates, or longer or shorter life spans of participants, among other variables. For example, in 2018, a decrease in the interest rate we apply in determining the present value of expected future defined benefit obligations of one-quarter of 1% would have increased our year-end defined benefit pension obligation for plans in Switzerland, the US, the UK, Germany and Japan, which represent 94% of the Group total defined benefit pension obligation, by USD 0.8 billion. Any differences between our assumptions and estimates and our actual experience could require us to make additional contributions to our pension funds. Further, additional employer contributions might be required if plan funding falls below the levels required by local rules. Either such event could have a material effect on our results of operations and financial condition.

For more information on obligations under retirement and other post-employment benefit plans and underlying actuarial assumptions, see “Item 5. Operating and Financial Review and Prospects—Item 5.A Operating results—Critical accounting policies and estimates—Retirement and other post-employment benefit plans” and “Item 18. Financial Statements—Note 24. Post-employment benefits for associates.” See also “—Political and economic instability may have a material adverse effect on our results,” above.

Changes in tax laws or their application could adversely affect our financial results.

Our multinational operations are taxed under the laws of the countries and other jurisdictions in which we operate. However, the integrated nature of our worldwide operations can produce conflicting claims from revenue authorities in different countries as to the profits to be taxed in the individual countries, including potential disputes relating to the prices our subsidiaries charge one another for intercompany transactions, known as transfer pricing. The majority of the jurisdictions in which we operate have double tax treaties with other foreign jurisdictions, which provide a framework for mitigating the impact of double taxation on our revenues and capital gains. However, mechanisms developed to resolve such conflicting claims are largely untried, and can be expected to be very lengthy.

In recent years, tax authorities around the world have increased their scrutiny of company tax filings, and have become more rigid in exercising any discretion they may have. As part of this, the Organization for Economic Co-operation and Development (OECD) has proposed a number of tax law changes under its Base Erosion and Profit Shifting (BEPS) Action Plans to address issues of transparency, coherence and substance.

At the same time, the European Commission is finalizing its Anti Tax Avoidance Directive, which seeks to prevent tax avoidance by companies and to ensure that companies pay appropriate taxes in the markets where profits are effectively made and business is effectively performed. The EU also adopted a new Directive on Administrative Cooperation (DAC6) in 2018, which seeks additional reporting. In addition, the European Commission continues to extend the application of its policies seeking to limit fiscal aid by member states to particular companies, and the related investigation of the member states’ practices regarding the issuance of rulings on tax matters relating to individual companies.

These OECD and EU tax reform initiatives also need local country implementation, including in our home country of Switzerland, which may result in significant changes to established tax principles. Although we have taken steps to be in compliance with the evolving OECD and EU tax initiatives, and will continue to do so, significant uncertainties remain as to the outcome of these efforts.

Switzerland is in the process of considering the implementation of corporate tax reform, which could become effective as early as the first quarter of 2019. However, the outcome of these efforts remains subject to change and could be enacted in a materially different form from what is currently proposed, or could be administered or implemented in a manner different from our expectations. There is also a risk that the EU may not be satisfied with the outcome of Switzerland’s tax reform efforts, and take steps to seek further changes. Accordingly, there can be no assurance that Swiss corporate tax reform will not adversely affect our business or financial condition.

In addition, in the US, the Tax Cuts and Jobs Act, enacted at the end of 2017, included substantial changes to the US taxation of individuals and businesses. Although the law substantially decreased tax rates applicable to corporations in the US, we do not yet know what all of the consequences of this new statute will be, including whether the law will have any unintended consequences. In particular, significant uncertainties remain as to how the US government will implement the new law, including with respect to the tax qualification of interest deductions, the concept of a

territorial tax regime, royalty payments and cost of goods sold.

In general, such tax reform efforts, including with respect to tax base or rate, transfer pricing, intercompany dividends, cross-border transactions, controlled corporations, and limitations on tax relief allowed on the interest on intercompany debt, will require us to continually assess our organizational structure against tax policy trends, and could lead to an increased risk of international tax disputes and an increase in our effective tax rate, and could adversely affect our financial results.

Counterfeit versions of our products could harm our patients and reputation.

Our industry continues to be challenged by the vulnerability of distribution channels to illegal counterfeiting and the presence of counterfeit products in a growing number of markets and over the internet. Counterfeit products are frequently unsafe or ineffective, and can potentially be life-threatening. To distributors and patients, counterfeit products may be visually indistinguishable from the authentic version. Reports of product

ineffectiveness or adverse reactions to counterfeit drugs, or increased levels of counterfeiting could affect patient confidence in our authentic products, and could harm our business or lead to litigation. In addition, it is possible that a lack of efficacy or adverse events caused by unsafe counterfeit products could mistakenly be attributed to the authentic product. If a product of ours was the subject of counterfeits, we could incur substantial reputational and financial harm.

Foreign exchange fluctuations may adversely affect our earnings and the value of some of our assets.

Changes in exchange rates between the US dollar, our reporting currency, and other currencies can result in significant increases or decreases in our reported sales, costs and earnings as expressed in US dollars, and in the reported value of our assets, liabilities and cash flows.

In addition to ordinary market risk, there is a risk that countries could take affirmative steps that could significantly impact the value of their currencies. Such steps could include "quantitative easing" measures and potential withdrawals by countries from common currencies. In addition, countries facing local financial difficulties, including countries experiencing high inflation rates and highly indebted countries facing large capital outflows, may impose controls on the exchange of foreign currency. Such exchange controls could limit our ability to distribute retained earnings from our local affiliates, or to pay intercompany payables due from those countries. See "—Political and economic instability may have a material adverse effect on our results," below.

Despite measures undertaken to reduce or hedge against foreign currency exchange risks, because a significant portion of our earnings and expenditures are in currencies other than the US dollar, including expenditures in Swiss francs that are significantly higher than our revenue in Swiss francs, any such exchange rate volatility may negatively and materially impact our results of operations and financial condition, and may impact the reported value of our net sales, earnings, assets and liabilities. In addition, the timing and extent of such volatility can be difficult to predict. Further, depending on the movements of particular foreign exchange rates, we may be materially adversely affected at a time when the same currency movements are benefiting some of our competitors.

For more information on the effects of currency fluctuations on our consolidated financial statements and on how we manage currency risk, see "Item 5. Operating and Financial Review and Prospects—Item 5.B Liquidity and capital resources—Effects of currency fluctuations," "Item 11. Quantitative and Qualitative Disclosures About Market Risk," and "Item 18. Financial Statements—Note 28. Financial instruments—additional disclosures."

Ongoing consolidation among our distributors and retailers is increasing both the purchasing leverage of key customers and the concentration of credit risk.

Increasingly, a significant portion of our global sales is made to a relatively small number of drug wholesalers, retail chains and other purchasing organizations. For example, our three most important customers globally are all in the US, and accounted for approximately 16%, 13% and 7%, respectively, of Group net sales in 2018. The largest trade receivables outstanding were for these three customers, amounting to 12%, 10% and 6%, respectively, of the Group's trade receivables at December 31, 2018. The trend has been toward further consolidation among distributors and retailers, both in the US and internationally. As a result, we may be affected by fluctuations in the buying patterns of such customers, and these customers are gaining additional purchasing leverage, increasing the pricing pressures facing our businesses. These pressures can particularly impact our Sandoz Division, the generic products of which can often be obtained from numerous competitors. Moreover, we are exposed to a concentration of credit risk as a result of this concentration among our customers. If one or more of our major customers experienced financial difficulties, the effect on us would be substantially greater than in the past, and could include a substantial loss of sales and an inability to collect amounts owed to us. Such events could have a material adverse effect on our business, financial condition, or results of operations.

An inability to attract and retain qualified personnel could adversely affect our business.

We highly depend upon skilled personnel in key parts of our organization, and we invest heavily in recruiting, training and retaining qualified individuals, including significant efforts to enhance the diversity of our workforce. The loss of the service of key members of our organization – including senior members of our scientific and management teams, high-quality researchers and development specialists, and skilled personnel in developing countries – could delay or prevent the achievement of major business objectives.

Our future growth will demand talented associates and leaders, yet the market for talent has become increasingly competitive. In particular, Emerging Growth Markets are expected to continue to be an important source of growth, but in many of these countries there is a limited pool of executives with the training and international experience

needed to work successfully in a global organization like Novartis.

In addition, shifting demographic trends are expected to result in fewer students, fewer graduates and fewer people entering the workforce in the Western world in the next 10 years. Moreover, many members of younger generations around the world have changing expectations toward careers, engagement and the integration of work in their overall lifestyles.

The supply of talent for certain key functional and leadership positions is decreasing, and a talent gap is visible for some professions and geographies – engineers in Germany, for example. Recruitment is increasingly regional or global in specialized fields such as clinical development, biosciences, chemistry and information technology. In addition, the geographic mobility of talent is expected to decrease in the future, with talented individuals in developed and developing countries anticipating ample career opportunities closer to home than in the past. This decrease in mobility may be worsened by anti-immigrant sentiments in many countries, and laws discouraging immigration. See "—Political and economic instability may impact our results," above.

In addition, our ability to hire qualified personnel also depends on the flexibility to reward superior performance and to pay competitive compensation. Laws and regulations on executive compensation, including legislation in our home country, Switzerland, may restrict our ability to attract, motivate and retain the required level of qualified personnel. We face intense competition for an increasingly limited pool of qualified individuals from numerous pharmaceutical and biotechnology companies, universities, governmental entities, other research institutions, other companies seeking to enter the healthcare space, and companies in other industries. As a result, despite significant efforts on our part, we may be unable to attract and retain qualified individuals in sufficient numbers, which could have an adverse effect on our business, financial condition, or results of operations.

Environmental liabilities may adversely impact our financial results.

The environmental laws of various jurisdictions impose actual and potential obligations on us to remediate contaminated sites, in some cases over many years. While we have set aside substantial provisions for worldwide environmental liabilities, there is no guarantee that additional costs will not be incurred beyond the amounts for which we have provided in the Group consolidated financial statements. If environmental contamination related to our facilities or products adversely impacts third parties, if we fail to properly manage the safety of our facilities and the environmental risks, or if we are required to further increase our provisions for environmental liabilities in the future, this could have a material adverse effect on our business, financial condition, results of operations, and reputation. See also “Item 4. Information on the Company—Item 4.D Property, plants and equipment—Environmental matters” and “Item 18. Financial Statements—Note 19. Provisions and other non-current liabilities.”

Climate change, extreme weather events, earthquakes and other natural disasters could adversely affect our business.

In recent years, extreme weather events and changing weather patterns such as storms, flooding, droughts and temperature changes have become more common. As a result, we are potentially exposed to varying natural disaster or extreme weather risks such as hurricanes, tornadoes, droughts or floods, or other events that may result from the impact of climate change on the environment, such as sea level rise. For example, some of our production facilities that depend on the availability of significant water supplies are located in areas where water is increasingly scarce. Other facilities are located in places that, because of increasingly violent weather events, sea level rise, or both, are increasingly at risk of substantial flooding. As a result, we could experience increased production or other costs, business interruptions, destruction of facilities, and loss of life, all of which could have a material adverse effect on our business, financial condition, or results of operations.

In addition, our corporate headquarters, the headquarters of our Innovative Medicines Division, and certain of our major Innovative Medicines Division production and research facilities are located near earthquake fault lines in Basel, Switzerland. Other major facilities are located near major earthquake fault lines in various locations around the world. In the event of a major earthquake, we could experience business interruptions, destruction of facilities, and loss of life, all of which could have a material adverse effect on our business, financial condition, or results of operations.

Risks related to our ADRs

The price of our ADRs and the US dollar value of any dividends may be negatively affected by fluctuations in the US dollar/Swiss franc exchange rate.

Our American Depositary Shares (ADSs), each representing one Novartis share and evidenced by American Depositary Receipts (ADRs), trade on the NYSE in US dollars. Since the shares underlying the ADRs are listed in Switzerland on the SIX Swiss Exchange (SIX) and trade in Swiss francs, the value of the ADRs may be affected by fluctuations in the US dollar/Swiss franc exchange rate. In addition, since dividends that we may declare will be denominated in Swiss francs, exchange rate fluctuations will affect the US dollar equivalent of dividends received by holders of ADRs. If the value of the Swiss franc decreases against the US dollar, the price at which our ADRs trade may – and the value of the US dollar equivalent of any dividend will – decrease accordingly.

Holders of ADRs may not be able to exercise pre-emptive rights attached to shares underlying ADRs.

Under Swiss law, shareholders have pre-emptive rights to subscribe for issuances of new shares on a *pro rata* basis. Shareholders may waive their pre-emptive rights in respect of any offering at a general meeting of shareholders. Pre-emptive rights, if not previously waived, are transferable during the subscription period relating to a particular offering of shares and may be quoted on the SIX. US holders of ADRs may not be able to exercise the pre-emptive rights attached to the shares underlying their ADRs unless a registration statement under the US Securities Act of 1933 is effective with respect to such rights and the related shares, or an exemption from this registration requirement

is available. In deciding whether to file such a registration statement, we would evaluate the related costs and potential liabilities, as well as the benefits of enabling the exercise by ADR holders of the pre-emptive rights associated with the shares underlying their ADRs. We cannot guarantee that a registration statement would be filed, or, if filed, that it would be declared effective. If pre-emptive rights could not be exercised by an ADR holder, JPMorgan Chase Bank, N.A., as depositary, would, if possible, sell the holder's pre-emptive rights and distribute the net proceeds of the sale to the holder. If the depositary determines, in its discretion, that the rights could not be sold, the depositary might allow such rights to lapse. In either case, the interest of ADR holders in Novartis would be diluted and, if the depositary allowed rights to lapse, holders of ADRs would not realize any value from the pre-emptive rights.

Item 4. Information on the Company

4.A History and development of Novartis

Novartis AG

Novartis AG was incorporated on February 29, 1996, under the laws of Switzerland as a stock corporation (*Aktiengesellschaft*) with an indefinite duration. On December 20, 1996, our predecessor companies, Ciba-Geigy AG and Sandoz AG, merged into this new entity, creating Novartis. We are domiciled in and governed by the laws of Switzerland. Our registered office is located at the following address:

Novartis AG
Lichtstrasse 35
CH-4056 Basel, Switzerland
Telephone: 011-41-61-324-1111
Web: www.novartis.com

Novartis is a multinational group of companies specializing in the research, development, manufacturing and marketing of a broad range of healthcare products led by innovative pharmaceuticals and also including high-quality generic pharmaceuticals and eye care products. Novartis AG, our Swiss holding company, owns, directly or indirectly, all of our significant operating companies. For a list of our significant operating subsidiaries, see “Item 18. Financial Statements—Note 31. Principal Group subsidiaries and associated companies.”

The SEC maintains an internet site at http://www.sec.gov that contains reports, information statements, and other information regarding issuers that file electronically with the SEC.

Important corporate developments 2016-2018

2018

December

Novartis announces that on December 21, 2018, it completed the previously-announced acquisition of Endocyte, a US-based biopharmaceutical company focused on developing targeted therapeutics for cancer treatment, in a transaction valued at approximately USD 2.1 billion.

Novartis announces that on December 19, 2018, it completed the acquisition of Tear Film Innovations, Inc., a privately-held company and manufacturer of the *iLux* Device, a therapeutic device used to treat meibomian gland dysfunction (MGD), a leading cause of dry eye.

Novartis announces the appointment of Susanne Schaffert, Ph.D., as CEO Novartis Oncology and a member of the Executive Committee of Novartis (ECN), effective January 1, 2019. Dr. Schaffert succeeds Liz Barrett, who stepped down effective December 31, 2018.

Novartis announces an offer to acquire Cell*for*Cure from LFB. Cell*for*Cure, a French company, is one of the first and largest contract development and manufacturing organizations producing cell and gene therapies in Europe. The transaction is subject to usual and customary closing conditions, including employee consultation process and necessary regulatory approvals.

November

Novartis announces that Alcon had filed an initial Form 20-F registration statement with the US Securities and Exchange Commission (SEC) in relation to the previously announced intention of Novartis to spin off the Alcon Division as an independent, publicly traded company. We expect to make an application to list the shares in Alcon on SIX and the NYSE under the ticker symbol “ALC.” Completion of the planned spin-off is subject to general market conditions, receipt of necessary authorizations, tax rulings and opinions, and shareholder approval at the 2019 Novartis annual shareholder meeting. If approvals are secured and conditions are met, the spin-off is expected to be completed in the first half of 2019.

October

Novartis announces that it has entered into a clinical development agreement with Pfizer that will include a study combining tropifexor and one or more Pfizer compounds for the treatment of nonalcoholic steatohepatitis (NASH).

Novartis announces that it has entered into a licensing and equity agreement with Boston Pharmaceuticals for the development of three novel anti-infective drug candidates that are part of the Novartis Infectious Diseases portfolio, which have the potential to address the need for new agents to treat antibiotic-resistant Gram-negative infections. Under the terms of the agreement, Boston Pharmaceuticals acquired worldwide rights to two complementary candidates targeting carbapenem-resistant enterobacteriaceae (CRE) and one candidate targeting Pseudomonas infections.

September

Novartis announces it has agreed to sell selected portions of its Sandoz US portfolio, specifically the Sandoz US dermatology business and generic US oral solids portfolio, to Aurobindo Pharma USA Inc., for USD 0.9 billion in cash plus USD 0.1 billion in potential earn-outs. This transaction is expected to close in 2019, subject to the completion of customary closing conditions.

Novartis announces that it plans to continue the transformation of its manufacturing network and services businesses, including a planned workforce reduction in Switzerland over a four-year period. Novartis also plans to continue the ongoing transfer of transactional activities to the five global service centers within Novartis Business Services, and to begin to transfer managerial service capabilities to these service centers.

August

Novartis announces the appointment of Dr. Klaus Moosmayer as Chief Ethics, Risk and Compliance Officer and a member of the ECN, reporting to the CEO of Novartis, effective December 1, 2018.

July

Novartis announces that it has signed a renewed Memorandum of Understanding with the World Health Organization to extend its agreement for the donation of *Egaten* (triclabendazole) for the treatment of liver fluke (fascioliasis) until 2022.

Novartis announces that it has entered into an exclusive in-license agreement with Galapagos NV and MorphoSys AG for an investigational biologic compound, MOR106, a novel antibody directed against IL-17C. This transaction became effective on September 10, 2018, upon the expiration of the applicable waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976.

June

Novartis announces its intention to seek shareholder approval for a 100% spin-off of its Alcon Division into a standalone public company. In addition to shareholder approval, completion of the proposed Alcon spin-off remains subject to certain conditions precedent, such as no material adverse events, receipt of necessary authorizations as well as tax rulings and opinions.

Novartis announces that it will initiate a share buyback of up to USD 5 billion to be executed by the end of 2019.

Novartis announces the completion on June 1, 2018, of its previously announced divestment to GlaxoSmithKline PLC of its 36.5% stake in GSK Consumer Healthcare Holdings Ltd. for a payment of USD 13.0 billion in cash. The divestment brings to an end Novartis participation in its consumer healthcare joint venture with GSK, which was formed in 2015 as part of the Novartis portfolio transformation.

May

Novartis announces that Shannon Thyme Klinger, previously Chief Ethics, Risk and Compliance Officer, was appointed Group General Counsel effective June 1, 2018, and will continue as a member of the ECN, following the decision by Felix R. Ehrat to retire from the Company.

Novartis announces that Robert Weltevreden will be appointed as Head of Novartis Business Services (NBS) and a member of the ECN, reporting to the CEO of Novartis, effective June 1, 2018.

Novartis announces the completion of its previously announced cash tender offer to purchase all the outstanding shares of common stock of AveXis, Inc., a US-based clinical stage gene therapy company. The lead AveXis product candidate, AVXS-101, has the potential to be the first-ever one-time gene replacement therapy for spinal muscular atrophy. This acquisition was completed on May 15, 2018.

April

Novartis announces the appointment of John Tsai, M.D., as Head of Global Drug Development (GDD) and Chief Medical Officer of Novartis, and a member of the ECN, reporting to the CEO of Novartis, effective May 1, 2018. Dr. Tsai succeeds Dr. Narasimhan, who became CEO of Novartis on February 1, 2018. Dr. Robert Kowalski, who led GDD ad interim from February 1, 2018, will resume his responsibilities as Head of Global Regulatory Affairs for GDD.

Novartis announces that its Sandoz Division has entered into a collaboration with Pear Therapeutics to commercialize and continue development of novel prescription digital therapeutics, including *reSET* for patients with substance use disorder and *reSET-O* for patients with opioid use disorder who are currently receiving buprenorphine. Novartis announced the commercial launch of *reSET* for patients with substance use disorder in November 2018 and announced FDA clearance of *reSET-O* for patients with opioid use disorder in December 2018 and launch in January

2019.

Novartis announces a five-year commitment to the fight against malaria in conjunction with the 7th Multilateral Initiative on Malaria Conference and the Malaria Summit of the Commonwealth Heads of Government meeting. As part of its commitment, Novartis will invest more than USD 100 million over the next five years to advance research and development of next-generation treatments to combat emerging resistance to artemisinin and other currently used antimalarials. The Company will also implement an equitable pricing strategy to maximize patient access in malaria-endemic countries when these new treatments become available.

25

March

Novartis announces that it has entered into a collaboration and licensing agreement with the Wyss Institute for Biologically Inspired Engineering at Harvard University and the Dana-Farber Cancer Institute to develop biomaterial systems for its portfolio of immuno-oncology therapies.

Novartis announces that Bertrand Bodson, Chief Digital Officer; Steffen Lang, Global Head Novartis Technical Operations; and Shannon Klinger, Chief Ethics, Risk and Compliance Officer, have been appointed to the ECN effective as of April 1, 2018. André Wyss, President Novartis Operations, has decided to step down from the ECN on April 1, 2018, to pursue his career outside of Novartis.

Novartis announces an additional strategic alliance with Science 37 to design and initiate up to 10 new clinical trials over the next three years, which are intended to blend virtual and traditional clinical trial models, with increasing degrees of decentralization toward a mostly “site-less” model.

Novartis announces a collaboration with Pear Therapeutics to develop novel prescription digital therapeutics, software applications designed to effectively treat disease and improve clinical outcomes for patients, for schizophrenia and multiple sclerosis.

February

Novartis announces an alliance with the Bill & Melinda Gates Foundation to advance development of Novartis drug candidate KDU731 for the treatment of cryptosporidiosis.

Novartis completes euro (EUR) denominated bond offerings totaling EUR 2.25 billion.

January

Novartis announces on January 22, 2018, that it had successfully completed its previously announced tender offer for all of the then-outstanding ordinary shares, including ordinary shares represented by American Depositary Shares (ADSs), of AAA. As of the expiration of the offer on January 19, 2018, approximately 97% of the then-outstanding fully diluted ordinary shares, including ordinary shares represented by ADSs, were validly tendered. In addition, on January 22, 2018, Novartis commenced a subsequent offering period that expired as scheduled on January 31, 2018. As of the expiration of the subsequent offering period, an additional 1.8% of the outstanding shares were validly tendered, resulting in an increase in Novartis ownership in AAA to 98.7% of all outstanding ordinary shares, including ordinary shares represented by ADSs. AAA is a radiopharmaceutical company headquartered in Saint Genis-Pouilly, France, that develops, produces and commercializes molecular nuclear medicines – including *Lutathera* (USAN: lutetium Lu 177 dotatate/INN: lutetium (^{177}Lu) oxodotreotide), a first-in-class radioligand therapy product for neuroendocrine tumors – and diagnostic products.

Novartis announces a licensing agreement and a manufacturing and supply agreement with Spark Therapeutics to develop, register and commercialize in markets outside the US voretigene neparvovec, a gene therapy approved as *Luxturna* in the EU in November 2018 for the treatment of patients with vision loss due to a genetic biallelic mutation of the RPE65 (retinal pigment epithelial 65kDa protein) gene and who have enough viable retinal cells.

Novartis announces a global collaboration between Sandoz and Biocon Ltd. to develop, manufacture and commercialize multiple biosimilars in immunology and oncology.

Novartis announces that Elizabeth (Liz) Barrett has been appointed CEO Novartis Oncology and a member of the ECN, effective February 1, 2018.

2017

December

Novartis announces that Bruno Strigini, CEO Novartis Oncology, has decided to retire from Novartis for personal reasons.

November

Novartis announces an expanded collaboration with Amgen and the Banner Alzheimer’s Institute to collaborate on a new Generation Study 2 to assess whether investigational BACE1 inhibitor CNP520 can prevent or delay the symptoms of Alzheimer’s disease in a high-risk population.

October

Novartis announces that it has made significant progress in its ongoing strategic review of the Alcon Division and has examined all options, ranging from retaining the business to a capital markets solution (e.g., an IPO or a spin-off). As part of this, we updated Alcon’s strategic plan, which confirms that it has the potential to grow sales at or above market while delivering profitability at least in line with the industry.

Novartis announces that its over-the-counter ophthalmic products and certain surgical diagnostic products will transfer from the Innovative Medicines Division to the Alcon Division effective January 1, 2018.

September

Novartis announces a collaboration with UC Berkeley to establish the Novartis-Berkeley Center for Proteomics and Chemistry Technologies.

Novartis announces that, effective February 1, 2018, Vasant (Vas) Narasimhan, M.D., will succeed Joseph Jimenez as CEO of Novartis, who had indicated his desire to retire after eight years as CEO. Robert Kowalski, Pharm.D., Head of Global Regulatory Affairs, will assume ad-interim leadership of our Global Drug Development organization, effective February 1, 2018.

August

Novartis announces that, effective January 1, 2018, Bertrand Bodson has been appointed to the new role of Chief Digital Officer, reporting to the CEO of Novartis. Mr. Bodson is responsible for creating and executing a companywide digital strategy. As part of this strategy, we plan to improve the ways we use data in drug discovery and development, engage with patients, doctors and other stakeholders, as well as to automate business processes.

June

Novartis announces that it has entered into a clinical research collaboration in which Bristol-Myers Squibb is to investigate the safety, tolerability and efficacy of *Mekinist* (trametinib) in combination with Opdivo® (nivolumab) and Opdivo® + Yervoy® (ipilimumab) regimen as a potential treatment option for metastatic colorectal cancer in patients with microsatellite stable tumors where the tumors are proficient in mismatch repair (MSS mCRC pMMR).

Novartis announces a collaboration with IBM Watson Health to explore development of a cognitive solution that uses real-world data and advanced analytical techniques with the aim to provide better insights on the expected outcomes of breast cancer treatment options.

May

Novartis announces the launch of Better Hearts Better Cities, an innovative initiative to address the high rates of high blood pressure in low-income urban communities.

April

Novartis announces an expanded collaboration agreement with Amgen to co-commercialize erenumab (AMG 334) in the US, currently being investigated for the prevention of migraine. This agreement builds on the previously announced 2015 global collaboration between Novartis and Amgen.

Novartis announces that it has entered into a clinical trial agreement with Allergan plc to conduct a Phase IIb study involving the combination of a Novartis FXR agonist and Allergan’s cenicriviroc for the treatment of nonalcoholic steatohepatitis (NASH).

Novartis announces that it has exercised an option to in-license ECF843, a recombinant form of human lubricin from Lubris, LLC, for ophthalmic indications worldwide (outside Europe). This transaction closed and Novartis received its exclusive license on April 21, 2017.

March

Novartis completes euro-denominated bond offerings in an amount equivalent to approximately USD 2 billion.

February

Novartis completes a USD 3 billion bond offering under its SEC Registration Statement on Form F-3.

January

Novartis announces that it is considering options for the Alcon Division. The review will explore all options, ranging from retaining all or part of the business to separation via a capital markets transaction (e.g., IPO or spin-off), in order to determine how to best maximize value for our shareholders.

Novartis announces that it is initiating a share buyback of up to USD 5.0 billion in 2017 under existing shareholder authority.

Novartis announces that it has entered into a collaboration and option agreement with Ionis Pharmaceuticals, Inc. (Ionis), and its affiliate Akcea Therapeutics, Inc. (Akcea), to license two investigational treatments with the potential to significantly reduce cardiovascular risk in patients suffering from high levels of lipoproteins known as Lp(a) and ApoCIII. In addition, Novartis entered into a stock purchase agreement with Ionis and Akcea. This transaction was completed on February 14, 2017.

2016

December

Novartis announces that it has entered into a definitive agreement for the acquisition of Encore Vision, Inc., a privately held company focused on the development of UNR844 (formerly EV06), an investigational, first-in-class, potentially disease-modifying topical treatment for presbyopia. This acquisition was completed on January 20, 2017.

Novartis announces the signing of an exclusive option, collaboration and license agreement with Conatus Pharmaceuticals Inc., for the global rights to emricasan, an investigational, first-in-class, oral, pan-caspase inhibitor for the treatment of nonalcoholic steatohepatitis (NASH) with advanced fibrosis and cirrhosis of the liver. Novartis

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exercised the option on May 4, 2017. Novartis obtained an exclusive, worldwide license to develop and commercialize products containing emricasan on July 5, 2017.

Novartis announces that it has entered into a definitive agreement for the acquisition of Ziarco Group Limited, a privately held company focused on the development of novel treatments in dermatology, including ZPL389 (adriforant), a once-daily oral H4 receptor antagonist in development for atopic dermatitis. This acquisition was completed on January 20, 2017.

November

Novartis announces that it has acquired Reprixys Pharmaceuticals Corporation and SEG101 (crizanlizumab) for reduction of pain crises in sickle cell disease.

September

Novartis completes two euro-denominated bond offerings totaling EUR 1.75 billion.

June

Novartis announces that it has entered into a collaboration and licensing agreement with Xencor for the development of bispecific antibodies for treating cancer.

Novartis announces that it will further expand its longstanding partnership with Medicines for Malaria Venture. Novartis will lead the development of antimalarial compound KAF156 (ganaplacide) with scientific and financial support from Medicines for Malaria Venture in collaboration with the Bill & Melinda Gates Foundation.

May

Novartis announces changes to focus its Pharmaceuticals Division by creating two business units: Novartis Pharmaceuticals and Novartis Oncology. These business units form the Innovative Medicines Division of Novartis. The CEO of each business unit reports directly to the CEO of Novartis, and both joined the ECN effective July 1, 2016.

February

Shareholders authorize the Novartis Board of Directors to execute share buybacks within the framework of a seventh share repurchase program that will allow Novartis to repurchase shares for cancellation up to a maximum of CHF 10 billion.

Novartis announces that it has entered into an agreement to acquire Transcend Medical, Inc., a privately held, US-based company focused on developing minimally invasive surgical devices to treat glaucoma, such as the *CyPass* Micro-Stent. This acquisition was completed on March 23, 2016.

Novartis announces that it has acquired from Pfizer the rights for the development and commercialization of PF-06438179 (biosimilar infliximab) in the European Economic Area.

January

Novartis announces leadership changes effective February 1, 2016. Mike Ball has been appointed Division Head and CEO Alcon, succeeding Jeff George; Dr. Vas Narasimhan has been appointed Global Head Drug Development and Chief Medical Officer, a new position in the ECN; and André Wyss has been appointed President, Novartis Operations.

Novartis announces that it is taking a number of steps to further build on its strategy, including focusing the Alcon Division on its Surgical and Vision Care franchises and strengthening the ophthalmic medicines business by transferring Alcon's Ophthalmic Pharmaceuticals products to the Innovative Medicines Division, and by shifting selected mature, non-promoted pharmaceutical products from the Innovative Medicines Division into the Sandoz Division, which changes were operationally completed as of April 1, 2016; and by centralizing manufacturing operations across divisions within a single technical operations unit; increasing Group-wide coordination of drug development by establishing a single Global Head of Drug Development and centralizing certain common functions such as the Chief Medical Office, which changes were operationally completed as of July 1, 2016.

Novartis announces a collaboration and licensing agreement with Surface Oncology, which gives Novartis access to four preclinical programs in immuno-oncology.

For information on our principal expenditures on property, plants and equipment, see "Item 4. Information on the Company—Item 4.D Property, plants and equipment." For information on our significant expenditures in research and development, see the sections headed "Research and Development" included in the descriptions of our Innovative Medicines Division and Alcon Division, and the section headed "Development and Registration" included in the description of our Sandoz Division under "Item 4. Information on the Company—Item 4.B Business overview." For

information on other principal capital expenditures and divestitures, see “Item 5. Operating and Financial Review and Prospects—Item 5.A Operating results—Factors affecting comparability of year-on-year results of operations.”

4.B Business overview

Overview

As a leading global medicines company, we use innovative science and digital technologies to create transformative treatments in areas of great medical need. In our quest to find new medicines, we consistently rank among the world's top companies investing in research and development. Novartis products reach more than 800 million people globally and we are finding innovative ways to expand access to our latest treatments. Our purpose is to reimagine medicine to improve and extend people's lives. Our vision is to be a trusted leader in changing the practice of medicine. Our strategy is to focus Novartis as a leading medicines company powered by advanced therapy platforms and data science.

In 2018, Novartis achieved net sales of USD 51.9 billion, while net income amounted to USD 12.6 billion. Headquartered in Basel, Switzerland, our Group companies employed 125,000 full-time equivalent associates as of December 31, 2018. Our products are sold in approximately 155 countries around the world.

The Group comprises three global operating divisions:

• Innovative Medicines: innovative patent-protected prescription medicines
• Sandoz: generic pharmaceuticals and biosimilars
• Alcon: surgical and vision care products

In June 2018, we announced that we plan to spin off Alcon into a separately-traded standalone company. As two distinct publicly traded companies, we believe Novartis and Alcon will be better positioned to capitalize on significant growth opportunities and focus resources on their respective businesses and strategic priorities.

Our divisions are supported by the following cross-divisional organizational units: the Novartis Institutes for BioMedical Research, Global Drug Development, Novartis Technical Operations and Novartis Business Services. The financial results of these organizational units are included in the results of the divisions for which their work is performed. As part of the planned spin-off of Alcon, efforts are being undertaken to prepare for the separation of Alcon from Novartis and to enable Alcon to operate as a standalone public company. As part of these efforts, Alcon has formed, and will continue to form, its own support functions, including its own service organization.

The Novartis Institutes for BioMedical Research (NIBR) is the innovation engine of Novartis, which conducts drug discovery research and early clinical development trials for our Innovative Medicines Division and also collaborates with our Sandoz Division. Approximately 6 000 full-time equivalent scientists and associates at NIBR are working to discover new medicines for various diseases at sites located in the US, Switzerland and China. For more information about NIBR, see "—Innovative Medicines—Research and development—Research program" below.

Our Global Drug Development (GDD) organization oversees all drug development activities for our Innovative Medicines Division and the biosimilars portfolio of our Sandoz Division. The development of products for the Surgical and Vision Care franchises within our Alcon Division and of small-molecule generics for our Sandoz Division is not included in GDD. GDD works collaboratively with NIBR, Innovative Medicines and Sandoz to execute our overall pipeline strategy and takes an enterprise approach to pipeline portfolio management. GDD incorporates centralized global functions such as Regulatory Affairs and Global Development Operations, as well as Global Development units aligned with our business franchises. GDD includes approximately 11 000 full-time equivalent associates worldwide.

Novartis Technical Operations (NTO) was established to centralize management of our manufacturing operations and supply chain across our Innovative Medicines and Sandoz Divisions, with a goal of further improving efficiency. Manufacturing for Alcon's Surgical and Vision Care franchises continues to be managed by our Alcon Division. NTO is expected to optimize capacity planning and adherence to quality standards, and to lower costs through simplification, standardization and external spend optimization. Centralization is also expected to improve our ability to develop next-generation technologies, implement continuous manufacturing and share best practices across divisions. NTO includes approximately 25 200 full-time equivalent associates and 64 manufacturing sites across our Innovative Medicines and Sandoz Divisions.

Novartis Business Services (NBS), our shared services organization, delivers integrated solutions to all Novartis divisions and units worldwide. NBS seeks to drive efficiency and effectiveness across Novartis by simplifying and standardizing services across six service domains: human resources, real estate and facility services, procurement,

information technology, commercial and medical support activities, and financial reporting and accounting operations. NBS has approximately 10 500 full-time equivalent associates in more than 30 countries. NBS works to leverage the full scale of Novartis to create value across the Company and to free up resources to invest in innovation and our product pipeline. NBS continues to transfer the delivery of selected services to its five Global Service Centers in Dublin, Ireland; Hyderabad, India; Kuala Lumpur, Malaysia; Mexico City, Mexico; and Prague, Czech Republic.
As of January 1, 2019, Novartis Internal Audit, Business Practices Office and Global Security were combined into one function called Novartis Business Assurance & Advisory (NBAA).

Innovative Medicines Division

Our Innovative Medicines Division researches, develops, manufactures, distributes and sells patented prescription medicines to enhance health outcomes for patients and healthcare providers. Innovative Medicines is organized into two global business units: Novartis Oncology and Novartis Pharmaceuticals. Novartis Pharmaceuticals consists of the global business franchises Ophthalmology; Neuroscience; Immunology, Hepatology and Dermatology; Respiratory; Cardio-Metabolic; and Established Medicines.

Sandoz Division

Our Sandoz Division develops, manufactures, distributes and sells prescription medicines as well as pharmaceutical active substances that are not protected by valid and enforceable third-party patents. Sandoz is organized globally into three franchises: Retail Generics, Anti-Infectives and Biopharmaceuticals. In Retail Generics, Sandoz develops, manufactures and markets active ingredients and finished dosage forms of pharmaceuticals to third parties. Retail Generics includes the areas of cardiovascular, central nervous system, dermatology, gastrointestinal and hormonal therapies, metabolism, oncology, ophthalmics, pain, and respiratory, as well as finished dosage form anti-infectives sold to third parties. In Anti-Infectives, Sandoz manufactures and supplies active pharmaceutical ingredients and intermediates – mainly antibiotics – for internal use by Retail Generics and for sale to third-party customers. In Biopharmaceuticals, Sandoz develops, manufactures and markets protein- or other biotechnology-based products, including biosimilars, and provides biotechnology manufacturing services to other companies.

Alcon Division

Our Alcon Division, a global leader in eye care, researches, develops, manufactures, distributes and sells eye care products. Alcon is organized into two global business franchises: Surgical and Vision Care. Surgical researches, develops, manufactures, distributes and sells ophthalmic products for cataract surgery, vitreoretinal surgery, refractive laser surgery and glaucoma surgery. The Surgical portfolio also includes implantables, consumables and surgical equipment required for these procedures and supports the end-to-end procedure needs of the ophthalmic surgeon. Vision Care researches, develops, manufactures, distributes and sells daily disposable, reusable, and color-enhancing contact lenses and a comprehensive portfolio of ocular health products, including products for dry eye, contact lens care and ocular allergies, as well as ocular vitamins and redness relievers. Alcon also provides services, training, education and technical support for both the Surgical and Vision Care businesses.

Effective January 1, 2018, we transferred our over the counter ophthalmic products and certain surgical diagnostic products (2017 sales of USD 747 million) from the Innovative Medicines Division to the Alcon Division. Our prescription Ophthalmic medicines business remains with the Innovative Medicines Division. In compliance with IFRS, beginning with our first-quarter 2018 results, Novartis updated its segment financial information to reflect this transfer, both for the current and prior years, to aid comparability of year on year results.

Corporate activities

We separately report the results of Corporate activities. The financial results of our Corporate activities include the costs of the Group headquarters and those of corporate coordination functions in major countries. In addition, Corporate includes other items of income and expense that are not attributable to specific segments, such as certain revenues from intellectual property rights and certain expenses related to post-employment benefits, environmental remediation liabilities, charitable activities, donations and sponsorships.

Corporate responsibility

We are taking steps to continue to build trust with key stakeholders and society. We aim to hold ourselves to the highest ethical standards, be part of the solution on pricing and access to medicines, help tackle global health challenges, and be a responsible citizen wherever we operate.

Holding ourselves to the highest ethical standards

We continue to embed a principles based approach to compliance through the new Professional Practices Policy (P3), which in 2018 replaced separate divisional compliance policies. We believe this approach will help ensure that employees act in the best interest of patients, physicians and Novartis.

Since 2016, we have adjusted the ratio of fixed to variable total compensation for our sales force to help ensure that the target variable component is a maximum of 35% of total compensation, on a country average basis. To receive any form of variable compensation, each employee, including the sales force, must perform to a minimum standard with regard to our Values and Behaviors, which include acting with integrity. For our sales force, in particular, 20% of target variable pay is based on demonstration of our Values and Behaviors. We are in the process of implementing

these standards in every country in which Novartis operates. Ultimately, no sales representative will receive the variable compensation unless he or she meets expectations with respect to Values and Behaviors. In 2018, we assessed the rollout of the new incentive system with positive results. Across divisions, there was a 54% reduction in the number of reported complaints of fraud or professional practices in the sales force in 2018 compared to 2017.
Despite this progress, we are still facing questions about our business practices. Following the issue with Essential Consultants, when our political consultancy practices came into question, we took steps to improve oversight and help prevent similar matters in the future. We have strengthened the relevant contracting and due diligence processes to help ensure more ownership and

transparency at a senior management level. For example, before Novartis engages political consultants, we will secure an independent due diligence report from an external partner.

In addition, we continue to strengthen our Integrity & Compliance (I&C) function. In 2018, we combined our risk management and compliance functions in a single organization to help enable more effective risk management and mitigation efforts. We created the role of Chief Ethics, Risk and Compliance Officer to head the combined organization, and we elevated this role to the Executive Committee of Novartis (ECN).

To help monitor and enforce our integrity standards, we added more than 100 people to the I&C function in recent years. The expanded team has increased the number of country visits to share learnings from across the organization, reaching about 220 in 2018. We also harmonized our I&C risk assessment and monitoring process and control activities into a single, continuous process supported by an online tool.

We continue to evolve our reporting and data analytics to provide centralized and aggregated data across the risk functions to identify trends and help improve risk mitigation. For instance, in the last two years, we have seen a positive trend in generally effective internal compliance audits. At the same time, our whistleblower hotline continues to receive reports of suspected cases where employees may have failed to follow our ethical guidelines. However, the proportion of substantiated allegations related to ethics and compliance matters remains stable. We believe these are indications that our efforts are starting to pay off. We also started to employ data analytics for better monitoring and risk prevention. For example, in the US and China, the team leverages big data to monitor various aspects of engagement with healthcare professionals.

Being part of the solution on pricing and access

Our medications reach more than 800 million people worldwide every year, but billions more still lack access to essential medicines and healthcare. We are making a fundamental shift in the way we do business and are reimagining how to expand access to critical healthcare innovations.

We launched the Novartis Access Principles, embarking on a journey to systematically integrate access strategies into how we research, develop and deliver our new medicines globally. These strategies include adopting innovative pricing and access models, refocusing research and development based on society's healthcare needs, and supporting approaches to strengthen healthcare systems. We made significant progress in setting up our internal systems and training our internal teams on our new business standards. The ECN reviewed plans for key brands in launch phase to assess access strategies targeting underserved populations. For example, *Aimovig,* our innovative medicine for the treatment of migraine, is supported by programs designed to help accelerate access both before and after reimbursement, as well as to speed up introduction and access in low- and middle-income countries (LMICs). We are also co-creating employer-based access schemes in selected markets, including Russia and Mexico.

We aim to price our medicines responsibly, based on the value they deliver to patients, healthcare systems and society. In the US we recently implemented guidelines for limiting average net price increases across our portfolio to the healthcare inflation rate, and we publish average price increases annually in the Novartis in Society US report.

In addition, we take local affordability into account when pricing our medicines. In LMICs, for instance, we introduced more affordable local brands of many innovative therapies, such as our heart failure treatment *Entresto*, to help speed up and improve access where there is inadequate healthcare coverage or reimbursement. Through our continued efforts and an impactful access strategy, the number of patients reached with *Entresto* in LMICs grew two-and-a-half-fold in the last 12 months. Overall, we have launched more than 60 local brands across more than 30 developing markets, reaching more than 220 000 additional patients to date. In addition, we are now able to reduce the time lag between availability of medicines in higher- and lower-income countries. For example, the first *Entresto* local brand was launched within 12 months of the launch in the European Union. We plan to further expand these strategies.

Through our Novartis Social Business (NSB) group, we continue to pursue unique social business models, such as the Novartis Access and Healthy Family programs, to help expand access to healthcare in lower-income countries. Novartis Access, which offers a portfolio of 15 medicines to governments, nongovernmental organizations and other institutional customers for USD 1 per treatment, per month, delivered almost 2.3 million monthly treatments to five countries in 2018, and Healthy Family reached 7.8 million people with health education initiatives. Since January, NSB has adapted its product and price offering in six African and Asian countries, expanding reach to patients across all income levels.

Novartis does not file or enforce patents in least developed countries or low-income countries. In late 2018, we reviewed our approach to patent filing in LMICs in an effort to better align it with the local socio-economic circumstances that exist in many of these countries. As a result, effective 2019, we decided to stop filing patent applications in nine LMICs, where Novartis had previously filed. In addition, in the remaining LMICs, we will aim to restrict patent filings to those patent applications covering new molecules or new chemical entities. Novartis is also a founding member of the Patent Information Initiative for Medicines (Pat-INFORMED), a unique public online resource launched in September 2018 that provides basic patent information for medicines of participating companies, and that aims to help procurement agencies around the world better understand patent status to help inform procurement decisions. As of December, Novartis has listed patent information for all of our small-molecule medicines, which goes significantly beyond Pat-INFORMED's near-term goal of capturing information for medicines in a more limited number of disease areas.

We regularly review our early- and late-stage development programs to identify further opportunities for adapting our existing medicines to address unmet patient needs in countries with a high disease burden. In 2018,

14 project proposals were endorsed to move forward. They include the development of a child-friendly formulation of hydroxyurea for treatment of sickle cell disease in Africa; the use of *Entresto* in heart failure related to Chagas disease; a project to identify potential differences in the pharmacokinetics of drugs in African patients, where such data is lacking; and the creation of a new *Coartem* formulation to treat infants below 5 kilograms of body weight.

Tackling global health challenges

Novartis has a long history of helping tackle some of the biggest global health challenges, particularly leprosy and malaria.

The Novartis Foundation helped found the Global Partnership for Zero Leprosy in 2018. It brings together international organizations and national leprosy programs, with support from the World Health Organization, to accelerate progress toward eliminating the disease. The Novartis Foundation and Microsoft are partnering to develop a proof-of-concept digital health tool, enabled by artificial intelligence, and a Leprosy Intelligent Image Atlas – in collaboration with local investigators from the Oswaldo Cruz Foundation in Brazil – to aid in the early detection of leprosy. The launch of the first public version of the atlas is planned for 2019.

In April, we renewed our commitment to malaria elimination, pledging USD 100 million to research and develop next-generation antimalarials over the next five years. In addition, we will help expand access to antimalarials formulated for children, and we plan to implement programs to strengthen healthcare systems in four sub-Saharan countries.

We also launched efforts in other areas where we believe we can have significant impact. In October, in Latin America, we kicked off our partnership with the World Heart Federation to develop a roadmap for addressing Chagas disease, the second most common cause of chronic heart failure in Latin America.

In Ghana, we kicked off a collaboration with the government and local partners to establish our commitment to sickle cell disease (SCD) in Africa. This collaboration aims to support the development of treatment guidelines; strengthen the healthcare system by establishing centers of excellence to advance newborn screening and train scientists; accelerate registration and launch of hydroxyurea for the treatment of SCD; and integrate the needs of patients into our drug development strategy. We plan to launch our commitment in 2019 and to also expand our efforts to other countries in sub-Saharan Africa.

Being a responsible citizen

Building trust with society requires doing business responsibly wherever we operate. This includes minimizing our environmental impact, managing risk in our supply chain, respecting human rights and being transparent.

We have adopted a more ambitious 2030 environmental sustainability strategy, aiming for carbon neutrality, plastic neutrality and water sustainability. We have already taken steps to mitigate our exposure to environmental risk, completing a series of comprehensive supplier audits and taking relevant actions. For example, in the Hyderabad area of India, we are severing ties with six suppliers that failed to comply with our Supplier Code, and we are working with nine suppliers to improve their performance in critical areas such as operational efficiency, waste management, and use of natural resources. These suppliers share our values for environmental stewardship and employee health and safety.

In October, our Third-Party Risk Management program went live in Mexico. The program is to be rolled out globally in 2019 in a phased regional approach, beginning in the Americas (including the US) and followed by Asia-Pacific and Europe later in the year.

After completing human rights impact assessments in our own operations in Egypt, Turkey, China and Malaysia, we have established that we have strong policies and solid processes to identify and manage potential human rights risks. We have also identified common risk areas that require additional follow up action in 2019. For example, we need more regular and broader engagement and consultation with external stakeholders at a local level – including representatives from patient groups, local communities, health authorities and third-party partners – to gain a better understanding of issues; to help ensure that formal grievance mechanisms and processes are in place for communities living close to our manufacturing operations; and, in some markets, to address risks associated with our outsourced workforce.

For additional information, see “—Item 4.B Business overview—Sandoz.”

Innovative Medicines

Overview

Our Innovative Medicines Division is a world leader in offering innovation-driven, patent-protected medicines to patients and physicians. The Innovative Medicines Division researches, develops, manufactures, distributes and sells patented pharmaceuticals, and is composed of two global business units: Novartis Oncology and Novartis Pharmaceuticals.

The Novartis Oncology business unit is responsible for the commercialization of products in the areas of cancer and hematologic disorders. The Novartis Pharmaceuticals business unit is organized into the following global business franchises responsible for the commercialization of various products in their respective therapeutic areas: Ophthalmology; Neuroscience; Immunology, Hepatology and Dermatology; Respiratory; Cardio-Metabolic; and Established Medicines.

Following an internal reorganization announced on January 27, 2016, 19 mature products were transferred from our Innovative Medicines Division to the Retail Generics franchise of our Sandoz Division, and the

Ophthalmic Pharmaceuticals products of Alcon were transferred to our Innovative Medicines Division, effective as of January 1, 2018.

We subsequently transferred our over-the-counter ophthalmic products and certain surgical diagnostic products (2017 sales of USD 747 million) from the Innovative Medicines Division to the Alcon Division, effective January 1, 2018. Our prescription Ophthalmic medicines business remains with the Innovative Medicines Division. In compliance with IFRS, beginning with our first-quarter 2018 results, Novartis updated its segment financial information to reflect this transfer, both for the current and prior years, to aid comparability of year-on-year results.

The Innovative Medicines Division is the largest contributor among the divisions of Novartis and reported consolidated net sales of USD 34.9 billion in 2018, which represented 67% of the Group's net sales.

The product portfolio of the Innovative Medicines Division includes more than 60 key marketed products, many of which are leaders in their respective therapeutic areas.

Innovative Medicines Division products

The following table and summaries describe certain key marketed products in our Innovative Medicines Division. While we typically seek to sell our marketed products throughout the world, not all products and indications are currently available in every country. In addition, a product may be available under different brand names depending on country and indication. Some of the products listed below have lost patent protection or are otherwise subject to generic competition. Others are subject to patent challenges by potential generic competitors. Please see "—Intellectual property" for general information on intellectual property and regulatory data protection, and for further information on the status of patents and exclusivity for Innovative Medicines Division products.

Selected marketed products
Novartis Oncology business unit

Business franchise	Product	Common name	Indications (vary by country and/or formulation)	Formulation
Oncology	*Afinitor/Votubia* and *Afinitor Disperz/Votubia* dispersible tablets	everolimus	In combination with exemestane for postmenopausal women with advanced hormone receptor-positive (HR+)/human epidermal growth factor receptor 2-negative (HER2-) breast cancer after failure of treatment with letrozole or anastrozole, or after recurrence or progression following treatment with a non-steroidal aromatase inhibitor Advanced renal cell carcinoma after failure of treatment with VEGF-targeted therapy, or after failure of treatment with sunitinib or sorafenib Advanced neuroendocrine tumors of gastrointestinal, lung or pancreatic origin Renal angiomyolipoma associated with tuberous sclerosis complex (TSC) in patients not requiring immediate surgery Subependymal giant cell astrocytoma associated with TSC in patients not requiring immediate surgery Adjunctive treatment of patients aged 2 years and older with TSC-associated partial-onset and refractory seizures	Tablet Dispersible tablet for oral suspension
	Arzerra	ofatumumab	Treatment of patients with chronic lymphocytic leukemia (CLL) who are refractory to fludarabine and alemtuzumab In combination with an alkylator-based regimen for the treatment of patients with CLL who have not received prior therapy and are not eligible for fludarabine-based therapy Maintenance/extended treatment for patients with CLL who are in complete or partial response after at least two lines of induction therapy In combination with fludarabine and cyclophosphamide for the treatment of patients with relapsed CLL	Intravenous infusion
	Exjade and *Jadenu*	deferasirox	Chronic iron overload due to blood transfusions and non-transfusion-dependent thalassemia	Dispersible tablet for oral suspension Oral film-coated tablet

			Granules
Farydak	panobinostat	Relapsed and/or refractory multiple myeloma, in combination with bortezomib and dexamethasone, after at least two prior regimens including bortezomib and an immunomodulatory agent	Capsule
Femara	letrozole	HR+ early breast cancer in postmenopausal women following surgery (upfront adjuvant therapy) Early breast cancer in postmenopausal women following standard tamoxifen therapy (extended adjuvant therapy) Advanced breast cancer in postmenopausal women (both as first- and second-line therapies)	Tablet
Gleevec/Glivec	imatinib mesylate/ imatinib	Certain forms of Philadelphia chromosome-positive chronic myeloid leukemia Certain forms of KIT-positive gastrointestinal stromal tumors Certain forms of acute lymphoblastic leukemia Dermatofibrosarcoma protuberans Hypereosinophilic syndrome Aggressive systemic mastocytosis Myelodysplastic/myeloproliferative diseases	Tablet Capsule
Jakavi	ruxolitinib	Disease-related splenomegaly or symptoms in adult patients with primary myelofibrosis (also known as chronic idiopathic myelofibrosis), post-polycythemia vera myelofibrosis or post-essential thrombocythemia myelofibrosis Polycythemia vera in adult patients who are resistant to or intolerant of hydroxyurea	Tablet
Kisqali	ribociclib	In combination with an aromatase inhibitor as initial endocrine-based therapy for the treatment of pre-, peri- or postmenopausal women with HR+/HER2- locally advanced or metastatic breast cancer In combination with fulvestrant as first- or second-line therapy for the treatment of postmenopausal women with HR+/HER2- advanced or metastatic breast cancer	Tablet
Kymriah	tisagenlecleucel	Children and young adults with relapsed or refractory B-cell acute lymphoblastic leukemia Adult patients with relapsed or refractory diffuse large B-cell	Suspension for intravenous infusion Dispersion for intravenous

		lymphoma Treatment of somatostatin receptor-positive gastroenteropancreatic neuroendocrine tumors (GEP-NETs) in adults	infusion
Lutathera	USAN: lutetium Lu 177 dotatate/ INN: lutetium (^{177}Lu) oxodotreotide	Treatment of unresectable or metastatic, progressive, well-differentiated (G1 and G2), somatostatin receptor-positive GEP-NETs in adults	Solution for intravenous infusion
Promacta/Revolade	eltrombopag	Thrombocytopenia in adult and pediatric patients 1 year and older with chronic immune (idiopathic) thrombocytopenia who have had an insufficient response to corticosteroids or immunoglobulins Thrombocytopenia in patients with chronic hepatitis C to allow initiation and maintenance of interferon-based therapy As first-line therapy in patients with severe aplastic anemia, and as second-line therapy in patients with severe aplastic anemia who have had an insufficient response to immunosuppressive therapy	Film-coated tablet

Business franchise	Product	Common name	Indications (vary by country and/or formulation)	Formulation
	Rydapt	midostaurin	In combination with standard cytarabine and daunorubicin induction and cytarabine consolidation chemotherapy for the treatment of adult patients with newly diagnosed acute myeloid leukemia (AML) who are FLT3 mutation-positive, as detected by an FDA-approved test (*Rydapt* is not indicated as a single-agent induction therapy for the treatment of patients with AML)	Capsule
	Sandostatin LAR and *Sandostatin* SC	octreotide acetate	For the treatment of adult patients with aggressive systemic mastocytosis, systemic mastocytosis with associated hematological neoplasm, or mast cell leukemia Acromegaly Symptom control for certain forms of neuroendocrine tumors Treatment of advanced neuroendocrine tumors of the midgut or of unknown primary origin	Vial Ampoule/pre-filled syringe Solution for subcutaneous injection in ampoule
	Signifor and *Signifor* LAR	pasireotide	Cushing's disease Acromegaly	Powder and solvent for suspension for IM injection
	Tafinlar + *Mekinist*	dabrafenib + trametinib	Unresectable or metastatic melanoma with BRAF V600E or V600K mutations, as detected by a validated test Adjuvant treatment of patients with stage III melanoma with a BRAF V600 mutation, following complete resection Locally advanced or metastatic anaplastic thyroid cancer with a BRAF V600E mutation and no satisfactory locoregional treatment options Metastatic non-small cell lung cancer with a BRAF V600E mutation, as detected by a validated test	Capsule *(Tafinlar)* Tablet *(Mekinist)*
	Tasigna	nilotinib	Certain forms of chronic myeloid leukemia in adult and pediatric patients resistant or intolerant to prior treatment, including *Gleevec/Glivec* First-line chronic myeloid leukemia in adult and	Capsule

			pediatric patients In combination with capecitabine for the treatment of patients with human epidermal growth factor receptor 2-positive (HER2+) advanced or metastatic breast cancer who have progressed on prior trastuzumab therapy In combination with an aromatase inhibitor (specifically letrozole in the US) for the treatment of patients with hormone-sensitive metastatic breast cancer	
	Tykerb/Tyverb	lapatinib	In combination with trastuzumab for patients with hormone receptor-negative (HR-) metastatic disease that has progressed on prior trastuzumab therapy/ therapies plus chemotherapy In combination with paclitaxel for first-line treatment of patients with HER2+ metastatic breast cancer for whom trastuzumab is not appropriate	Tablet
	Votrient	pazopanib	Advanced renal cell carcinoma Certain types of advanced soft tissue sarcoma after prior chemotherapy	Tablet
	Zometa	zoledronic acid	Skeletal-related events from bone metastases Hypercalcemia of malignancy	Vial/4 mg ready-to-use
	Zykadia	ceritinib	Advanced or metastatic non-small cell lung cancer that is anaplastic lymphoma kinase-positive	Capsule

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Novartis Pharmaceuticals business unit

Business franchise	Product	Common name	Indications (vary by country and/or formulation)	Formulation
Ophthalmology	Azarga/Azorga	brinzolamide and timolol	Decrease of intraocular pressure in adult patients with open-angle glaucoma or ocular hypertension for whom monotherapy provides insufficient intraocular pressure reduction	Eye drops
	Ciprodex	ciprofloxacin and dexamethasone	Treatment of bacterial ear infections	Ear drops
	Duotrav	travoprost and timolol	Reduction of elevated intraocular pressure in patients with open-angle glaucoma or ocular hypertension	Eye drops
	Durezol	difluprednate	Treatment of inflammation and pain associated with ocular surgery Treatment of endogenous anterior uveitis	Eye drops
	Lucentis	ranibizumab	Neovascular age-related macular degeneration Visual impairment due to diabetic macular edema Visual impairment due to macular edema secondary to central retinal vein occlusion Visual impairment due to macular edema secondary to branch retinal vein occlusion Visual impairment due to choroidal neovascularization secondary to pathologic myopia Visual impairment due to choroidal neovascularization secondary to other pathologies	Intravitreal injection
	Luxturna	voretigene neparvovec	Treatment of adult and pediatric patients with vision loss due to inherited retinal dystrophy caused by confirmed biallelic RPE65 mutations and who have sufficient viable retinal cells	Subretinal injection
	Pataday and *Pazeo*	olopatadine	Signs and symptoms of allergic conjunctivitis Ocular itching associated with allergic conjunctivitis	Eye drops
	Patanol	olopatadine	Signs and symptoms of allergic conjunctivitis	Eye drops
	Simbrinza	brinzolamide and brimonidine tartrate	Decrease of elevated intraocular pressure in adult patients with open-angle	Eye drops

			glaucoma or hypertension for whom monotherapy provides insufficient intraocular pressure reduction	
	Travatan, Travatan Z, Travatan BAK-Free, *Izba*	travoprost	Reduction of elevated intraocular pressure in patients with open-angle glaucoma or ocular hypertension	Eye drops
Immunology, Hepatology and Dermatology	Cosentyx	secukinumab	Active ankylosing spondylitis Active psoriatic arthritis Moderate-to-severe plaque psoriasis Pustular psoriasis	Auto-injector Lyophilized, pre-filled syringe
	Ilaris	canakinumab	Cryopyrin-associated periodic syndromes Tumor necrosis factor receptor-associated periodic syndrome Hyperimmunoglobulin D syndrome/mevalonate kinase deficiency Familial Mediterranean fever Systemic juvenile idiopathic arthritis Gouty arthritis Adult-onset Still's disease	Solution for injection Lyophilized powder for reconstitution for subcutaneous injection
	Xolair	omalizumab	Chronic spontaneous urticaria/chronic idiopathic urticaria See also "Respiratory"	Liquid formulation in pre-filled syringe Lyophilized powder in vial Subcutaneous injection
Neuroscience	Aimovig	erenumab	Preventive treatment of migraine	
	Extavia	interferon beta-1b	Relapsing-remitting and/or relapsing forms of multiple sclerosis (MS) in adult patients, and for patients who have had a single clinical event suggestive of MS and are at high risk of developing clinically definite MS	Subcutaneous injection
	Gilenya	fingolimod	Relapsing forms of MS	Capsule
Respiratory	Onbrez Breezhaler	indacaterol	Chronic obstructive pulmonary disease	Inhalation powder hard capsules
	Seebri Breezhaler	glycopyrronium bromide	Chronic obstructive pulmonary disease	Inhalation powder hard capsules
	Ultibro Breezhaler	indacaterol and glycopyrronium bromide	Chronic obstructive pulmonary disease	Inhalation powder hard capsules
	Xolair	omalizumab	Moderate to severe allergic asthma See also "Immunology, Hepatology and Dermatology"	Lyophilized powder in vial Liquid

				formulation in pre-filled syringe
Cardio-Metabolic 36	Entresto	sacubitril/valsartan	Symptomatic chronic heart failure with reduced ejection fraction in adults	Tablet

Business franchise	Product	Common name	Indications (vary by country and/or formulation)	Formulation
Established Medicines	Cibacen	benazepril hydrochloride	Hypertension Adjunct therapy in congestive heart failure Progressive chronic renal insufficiency	Tablet
	Comtan	entacapone	Parkinson's disease patients who experience end-of-dose motor (or movement) fluctuations	Tablet
	Diovan	valsartan	Hypertension Heart failure Post-myocardial infarction	Tablet Capsule Oral solution
	Diovan HCT/Co-Diovan	valsartan and hydrochlorothiazide	Hypertension	Tablet
	Eucreas	vildagliptin and metformin	Type 2 diabetes	Tablet
	Exelon	rivastigmine	Mild-to-moderate Alzheimer's disease dementia Severe Alzheimer's disease dementia Dementia associated with Parkinson's disease	Capsule Oral solution Transdermal patch
	Exforge	valsartan and amlodipine besylate	Hypertension	Tablet
	Exforge HCT	valsartan, amlodipine besylate and hydrochlorothiazide	Hypertension	Tablet
	Focalin and *Focalin XR*	dexmethylphenidate HCl and dexmethylphenidate extended release	Attention deficit hyperactivity disorder	Tablet Capsule
	Galvus	vildagliptin	Type 2 diabetes	Tablet
	Lescol and *Lescol XL*	fluvastatin sodium	Hypercholesterolemia and mixed dyslipidemia in adults Secondary prevention of major adverse cardiac events Slowing the progression of atherosclerosis Heterozygous familial hypercholesterolemia in children and adolescents	Capsule *(Lescol)* Tablet *(Lescol XL)*
	Myfortic	mycophenolic acid (as mycophenolate sodium)	Prophylaxis of organ rejection in patients receiving allogeneic renal transplants	Gastro-resistant tablet
	Neoral/Sandimmune	cyclosporine, USP Modified	Prevention of rejection following certain organ transplantation Non-transplantation autoimmune conditions such as severe psoriasis	Capsule Oral solution Intravenous *(Sandimmune)*

		and severe rheumatoid arthritis	
Ritalin	methylphenidate HCl	Attention deficit hyperactivity disorder and narcolepsy	Tablet
Ritalin LA	methylphenidate HCl-modified release	Attention deficit hyperactivity disorder	Capsule
Simulect	basiliximab	Prevention of acute organ rejection in de novo renal transplantation	Vial for injection or infusion
Stalevo	carbidopa, levodopa and entacapone	Parkinson's disease patients who experience end-of-dose motor (or movement) fluctuations	Tablet
Tegretol	carbamazepine	Epilepsy Pain associated with trigeminal neuralgia Acute mania and bipolar affective disorders Alcohol withdrawal syndrome Painful diabetic neuropathy Diabetes insipidus centralis Polyuria and polydipsia of neurohormonal origin	Tablet Chewable tablet Oral suspension Suppository
Trileptal	oxcarbazepine	Epilepsy	Tablet Oral suspension
Tyzeka/Sebivo	telbivudine	Chronic hepatitis B	Tablet Oral solution
Voltaren/Cataflam	diclofenac sodium/ potassium/resinate/ free acid	Inflammatory and degenerative forms of rheumatism Post-traumatic and postoperative pain, inflammation and swelling Painful and/or inflammatory conditions in gynecology Other painful and/or inflammatory conditions such as renal and biliary colic; migraine attacks; and as adjuvant in severe ear, nose and throat infections Post-traumatic inflammation of the tendons, ligaments, muscles and joints Localized forms of soft-tissue and degenerative rheumatism	Tablet Capsule Oral drops/ oral suspension Ampoule for injection Suppository Gel Powder for oral solution Transdermal patch
Zortress/Certican	everolimus	Prevention of organ rejection (heart, liver and kidney)	Tablet Dispersible tablet

Key marketed products
Novartis Oncology business unit
Oncology
• *Tasigna* (nilotinib) is a signal transduction inhibitor of the BCR-ABL tyrosine kinase. Since its launch in 2007, *Tasigna* has been approved in more than 125 countries to treat patients with Philadelphia chromosome-positive chronic myeloid leukemia (Ph+ CML) in the chronic and/or accelerated phase who are resistant or intolerant to existing treatment, including *Gleevec/Glivec*, and to treat newly diagnosed patients in the chronic phase. In June 2017, the European Commission (EC) approved the inclusion of treatment-free remission data in the summary of product characteristics for *Tasigna*. In December 2017, the FDA also approved the inclusion of treatment-free remission data in the US label for *Tasigna*. In November 2017, the EC approved *Tasigna* for the treatment of newly diagnosed pediatric patients with Ph+ CML in the chronic phase (CP), and Ph+ CML-CP pediatric patients with resistance or intolerance to prior therapy including imatinib. In March 2018, the FDA approved *Tasigna* for this pediatric indication.
• *Sandostatin* SC (octreotide acetate for injection) and *Sandostatin* LAR (octreotide acetate for injectable suspension) are somatostatin analogs indicated for the treatment of patients with acromegaly, a chronic disease caused by the over-secretion of growth hormone in adults. *Sandostatin* is also indicated for the treatment of patients with certain symptoms associated with carcinoid tumors and other types of gastrointestinal and pancreatic neuroendocrine tumors. Additionally, *Sandostatin* LAR is approved in more than 60 countries for the treatment of patients with advanced neuroendocrine tumors of the midgut or unknown primary tumor location. *Sandostatin* SC was first launched in 1988 and is approved in more than 100 countries.
• *Gleevec/Glivec* (imatinib mesylate/imatinib) is a kinase inhibitor approved as a targeted therapy for adult and pediatric patients with Ph+ CML in the chronic phase. It is also approved to treat patients with Ph+ CML in the blast, accelerated or chronic phase after failure with interferon; to treat patients with metastatic and/or unresectable gastrointestinal stromal tumors (GIST) that are KIT (CD117)-positive (KIT+); and as an adjuvant treatment for certain adult patients following resection of KIT+ GIST. First launched in 2001, *Gleevec/Glivec* is approved in approximately 125 countries. It is approved in more than 80 countries as a post-surgery therapy for certain adult patients with KIT+ GIST. Additionally, *Gleevec/Glivec* is approved in the US, the EU and Japan to treat Ph+ acute lymphoblastic leukemia (a rapidly progressive form of leukemia); in the US and EU to treat dermatofibrosarcoma protuberans (a rare solid tumor), hypereosinophilic syndrome, myelodysplastic/myeloproliferative diseases and other rare blood disorders; and in the US (as *Gleevec*) to treat aggressive systemic mastocytosis.
• *Afinitor/Votubia* (everolimus) is an oral inhibitor of the mTOR pathway. *Afinitor* is approved in more than 120 countries, including the US, EU member states and Japan, for patients with advanced renal cell carcinoma whose disease has progressed during or after treatment with vascular endothelial growth factor-targeted therapy (in the EU), or after failure of treatment with sunitinib or sorafenib (in the US). Additionally, *Afinitor* is approved in more than 110 countries, including the US, EU member states and Japan, for patients with progressive neuroendocrine tumors (NETs) of pancreatic origin that are unresectable, locally advanced or metastatic; in more than 45 countries, including the US and EU member states, for patients with progressive, well-differentiated, nonfunctional NETs of gastrointestinal or lung origin that are unresectable, locally advanced or metastatic; and in 117 countries, in combination with exemestane, for postmenopausal women with advanced hormone receptor-positive (HR+)/human epidermal growth factor receptor 2-negative (HER2-) breast cancer after recurrence or progression following treatment with a nonsteroidal aromatase inhibitor (in the EU), or after failure of treatment with letrozole or anastrozole (in the US). All oncology indications are approved under the trade name *Afinitor,* in the tablet formulation. Everolimus, under the trade name *Afinitor* in the US and *Votubia* in the EU, is also approved in more than 100 countries to treat patients with tuberous sclerosis complex (TSC) who have subependymal giant cell astrocytoma (SEGA) not requiring immediate surgery, and in more than 95 countries to treat patients with TSC who have renal angiomyolipoma not requiring immediate surgery. The dispersible tablets for oral suspension formulation are approved in more than 40 countries – including the US (under the trade name *Afinitor Disperz*), EU member states (under the trade name *Votubia*) and Japan (under the trade name *Afinitor*) – for patients with TSC who have SEGA. Dispersible tablets are also approved in more than 30 countries – including EU member states (as *Votubia*) and the US (as *Afinitor Disperz*) – as adjunctive treatment for patients aged 2 years and older with TSC-associated partial-onset seizures. Everolimus is available under the trade names *Zortress/Certican* for use in transplantation in the US and EU,

respectively. It is exclusively licensed to Abbott and sublicensed to Boston Scientific for use in drug-eluting stents.
• *Promacta/Revolade* (eltrombopag) is a once-daily oral thrombopoietin receptor agonist that works by stimulating bone marrow cells to produce platelets. It is the only approved once-daily oral thrombopoietin receptor agonist, and is marketed under the brand name *Promacta* in the US and *Revolade* in most countries outside the US. It is approved in more than 90 countries for the treatment of thrombocytopenia in adult patients with chronic immune (idiopathic) thrombocytopenia (ITP) who have had an inadequate response or are intolerant to other treatments. In the US and EU, *Promacta/Revolade* is approved for pediatric patients 1 year and older with chronic ITP who have had an insufficient response to other treatments. *Promacta/Revolade* is also approved in more than 40 countries for the treatment of thrombocytopenia in patients with chronic hepatitis C to allow them to initiate and maintain interferon-based therapy. It is approved in the US and Japan for aplastic anemia as first-line therapy, and in 45 countries for the treatment of patients with severe

aplastic anemia (SAA) who are refractory to other treatments (including in the EU for adults with acquired SAA who were either refractory to prior immunosuppressive therapy or heavily pretreated and are unsuitable for hematopoietic stem cell transplant). *Promacta/Revolade* is marketed under a collaboration agreement between Ligand Pharmaceuticals, Inc. and Novartis.

• *Tafinlar + Mekinist* (dabrafenib + trametinib) is a combination therapy approved for the treatment of patients with unresectable or metastatic melanoma with a BRAF V600 mutation; the adjuvant treatment of patients with stage III melanoma with a BRAF V600 mutation; the treatment of patients with advanced non-small cell lung cancer with a BRAF V600 mutation; and the treatment of patients with locally advanced or metastatic anaplastic thyroid cancer with a BRAF V600 mutation. Usage in the adjuvant treatment of melanoma was approved in the US, the EU, Japan and other countries worldwide in 2018, making *Tafinlar + Mekinist* the first targeted therapy approved in this setting. The 2018 FDA approval of *Tafinlar + Mekinist* for the treatment of anaplastic thyroid cancer represented the first approval of any therapy in the US for this aggressive form of thyroid cancer. *Tafinlar* and *Mekinist* are kinase inhibitors of BRAF and MEK1/2, respectively, and are also indicated as single agents to treat patients with unresectable or metastatic melanoma with a BRAF V600 mutation. Novartis has worldwide exclusive rights to develop, manufacture and commercialize trametinib granted by Japan Tobacco Inc.

• *Exjade* and *Jadenu* (deferasirox) is an oral iron chelator approved for the treatment of chronic iron overload due to blood transfusions in patients 2 years of age and older, and of chronic iron overload in patients 10 years of age and older with non-transfusion-dependent thalassemia. *Exjade,* a dispersible tablet for oral suspension, was first approved in 2005 and is now approved in more than 100 countries, including the US, the EU and Japan. An oral film-coated tablet formulation that can be swallowed or crushed is also approved in countries including the US and Canada (under the *Jadenu* or *Exjade* trade name, depending on the country). Additionally, the formulation has been developed as granules and is approved in the US, the EU and Japan.

• *Jakavi* (ruxolitinib) is an oral inhibitor of the JAK1 and JAK2 tyrosine kinases. It is the first JAK inhibitor indicated for the treatment of disease-related splenomegaly or symptoms in adult patients with primary myelofibrosis, post-polycythemia vera myelofibrosis or post-essential thrombocythemia myelofibrosis, and for the treatment of adult patients with polycythemia vera who are resistant or intolerant to hydroxyurea. *Jakavi* is currently approved in more than 100 countries for patients with myelofibrosis, and in more than 75 countries – including EU member states and Japan – for patients with polycythemia vera. Novartis licensed ruxolitinib from Incyte Corporation for development and commercialization in the indications of oncology, hematology and Graft-versus-host disease outside the US. Ruxolitinib, marketed in the US as Jakafi® by Incyte Corporation, was approved by the FDA for the treatment of patients with intermediate or high-risk myelofibrosis, including primary myelofibrosis, post-polycythemia vera myelofibrosis and post-essential thrombocythemia myelofibrosis. Jakafi® was also approved by the FDA for the treatment of patients with polycythemia vera who have had an inadequate response or are intolerant to hydroxyurea.

• *Votrient* (pazopanib) is a small-molecule tyrosine kinase inhibitor that targets a number of growth factors to limit new blood vessel and tumor growth and cell survival. *Votrient* is approved in the US for the treatment of patients with advanced renal cell carcinoma (RCC), and in the EU for first-line treatment of adult patients with advanced RCC and for patients who have received prior cytokine therapy for advanced disease. *Votrient* is also indicated for the treatment of patients with advanced soft tissue sarcoma (STS) who have received prior chemotherapy (efficacy in adipocytic STS or gastrointestinal stromal tumors has not been demonstrated), and in the EU for the treatment of adult patients with selective subtypes of advanced STS who have received prior chemotherapy for metastatic disease or who have progressed within 12 months after (neo)adjuvant therapy. *Votrient* is approved in more than 100 countries worldwide for advanced RCC and in more than 90 countries for advanced STS.

• *Kisqali* (ribociclib) is a cyclin-dependent kinase inhibitor, a class of drugs that helps slow the progression of cancer by inhibiting two proteins called cyclin-dependent kinase 4 and 6 (CDK4/6). It is indicated for the treatment of postmenopausal women (and, in the US, pre- or perimenopausal women) with HR+/HER2- locally advanced or metastatic breast cancer as initial endocrine-based therapy in combination with an aromatase inhibitor. In the US and the EU, *Kisqali* is also indicated for use in combination with fulvestrant as first- or second-line therapy in postmenopausal women. *Kisqali* was originally approved in the US in 2017 and is now approved in more than 70 countries, including EU member states. In 2017, the FDA also approved the *Kisqali Femara* Co-Pack (ribociclib tablets and letrozole tablets). *Kisqali* was developed by the Novartis Institutes for BioMedical Research under a research collaboration with Astex Pharmaceuticals.

• *Kymriah* (tisagenlecleucel) suspension for intravenous infusion is a CD19-directed genetically modified autologous chimeric antigen receptor T-cell (CAR-T) therapy. *Kymriah* received FDA approval in 2017 for the treatment of patients up to 25 years of age with B-cell precursor acute lymphoblastic leukemia (ALL) that is refractory or in second or later relapse, and in May 2018 for the treatment of adult patients with relapsed or refractory (r/r) large B-cell lymphoma, including diffuse large B-cell lymphoma (DLBCL), high-grade B-cell lymphoma, and DLBCL arising from follicular lymphoma. *Kymriah* is not indicated for the treatment of patients with primary central nervous system lymphoma. *Kymriah* is also approved in countries including EU

member states and Switzerland for the treatment of children and young adults with r/r B-cell ALL, and adult patients with r/r DLBCL.

• *Lutathera* (USAN: lutetium Lu 177 dotatate/INN: lutetium (177Lu) oxodotreotide) is a lutetium Lu 177-labeled somatostatin analog peptide. It is a radioligand therapy and comprises a targeting molecule that carries a radioactive component. *Lutathera* has received orphan drug designation from the FDA and the EMA. In the US, *Lutathera* is approved for the treatment of somatostatin receptor-positive gastroenteropancreatic neuroendocrine tumors (GEP-NETs), including foregut, midgut and hindgut neuroendocrine tumors, in adults. In Europe, it is approved for the treatment of unresectable or metastatic, progressive, well-differentiated (G1 and G2), somatostatin receptor-positive GEP-NETs in adults.

Novartis Pharmaceuticals business unit

Ophthalmology

• *Lucentis* (ranibizumab) is a recombinant humanized high-affinity antibody fragment that binds to vascular endothelial growth factor A (VEGF-A), a key mediator of intraocular neovascularization. *Lucentis* is an anti-VEGF therapy specifically designed for the eye, minimizing systemic exposure. It is approved for six indications: neovascular (wet) age-related macular degeneration (nAMD), visual impairment due to diabetic macular edema (DME), visual impairment due to macular edema secondary to branch retinal vein occlusion (BRVO), visual impairment due to macular edema secondary to central retinal vein occlusion (CRVO), visual impairment due to choroidal neovascularization secondary to pathologic myopia (myopic CNV), and visual impairment due to choroidal neovascularization (CNV) secondary to other pathologies. *Lucentis* is available in more than 110 countries, and the *Lucentis* pre-filled syringe has launched in 37 countries. *Lucentis* is licensed from Genentech, and Novartis holds the rights to commercialize the product outside the US. Genentech holds the rights to commercialize *Lucentis* in the US. For further information, see “Item 18. Financial Statements—Note 26. Transactions with related parties—Genentech/Roche.”

• *Travatan* (travoprost), *Travatan Z* (travoprost) and *Duotrav* (travoprost/timolol) are indicated for the reduction of elevated intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension. Single-agent travoprost products (*Travatan*, *Travatan Z*, *Travatan* BAK-Free and *Izba*) are prescribed as first-line agents and are marketed in more than 110 countries, including the US and EU member states. *Duotrav* is a fixed-dose combination solution of the prostaglandin analog travoprost with the beta-blocker timolol, and is approved as a second-line treatment in adults for the reduction of IOP in patients with open-angle glaucoma or ocular hypertension who are insufficiently responsive to topical beta-blockers or prostaglandin analogs. *Duotrav* is currently marketed in more than 105 countries, including EU member states.

• *Luxturna* (voretigene neparvovec) is a one-time gene therapy approved in the EU in November 2018 to treat children and adults with vision loss caused by mutations in both copies of the RPE65 gene and who have sufficient viable retinal cells. In January 2018, Spark Therapeutics entered into a licensing agreement and a manufacturing and supply agreement with Novartis covering development, registration and commercialization rights to *Luxturna* in markets outside the US. Upon the transfer of the EU marketing authorization from Spark Therapeutics to Novartis, Novartis plans to commercialize *Luxturna* in the EU/EEA, with Spark Therapeutics as supplier of the gene therapy.

Immunology, Hepatology and Dermatology

• *Cosentyx* (secukinumab) is a fully human monoclonal antibody that selectively inhibits circulating interleukin-17A (IL-17A), a cytokine involved in the pathogenesis of psoriasis, ankylosing spondylitis and psoriatic arthritis. *Cosentyx* is approved in more than 90 countries, including the US, EU member states and Japan, for the treatment of moderate-to-severe plaque psoriasis. It is approved in more than 80 countries, including the US, EU member states and Japan, for the treatment of adults with ankylosing spondylitis and psoriatic arthritis. *Cosentyx* is also approved in Japan for the treatment of pustular psoriasis and psoriasis vulgaris. In 2017, a label update for *Cosentyx* was approved in the EU based on data showing long-term superiority over Stelara® (ustekinumab) in moderate-to-severe plaque psoriasis, along with efficacy in the treatment of moderate-to-severe scalp psoriasis – one of the most difficult-to-treat forms of the disease. In 2018, the FDA approved a label update for *Cosentyx* to include moderate-to-severe scalp psoriasis, and new evidence that *Cosentyx* inhibits progression of joint structural damage in psoriatic arthritis.

• *Xolair* (omalizumab) is a recombinant, DNA-derived, humanized IgG1 monoclonal antibody. *Xolair* is designed to block IgE, which limits the release of mediators in the early and late phases of the allergic cascade. It is currently approved in more than 90 countries, including the US, EU member states and Japan, as a treatment for chronic spontaneous urticaria (CSU), also known as chronic idiopathic urticaria (CIU). In the EU, *Xolair* is indicated as

add-on therapy for the treatment of CSU in adults and adolescents 12 years of age and older with inadequate response to H1 antihistamine treatment. In the US, *Xolair* is approved to treat adults and adolescents 12 years of age and older with CIU who remain symptomatic despite H1 antihistamine treatment. (See also *Xolair* in "Respiratory" below.) We co-promote *Xolair* with Genentech in the US and share a portion of operating income, but we do not record any US sales. Novartis records all sales of *Xolair* outside the US. For further information, see "Item 18. Financial Statements—Note 26. Transactions with related parties—Genentech/Roche."

• *Ilaris* (canakinumab) is a selective, high-affinity fully human monoclonal antibody that inhibits interleukin-1 beta (IL-1 beta), a key cytokine in the inflammatory pathway. *Ilaris* is approved in the US, EU member states and

Japan to treat systemic juvenile idiopathic arthritis and various auto-inflammatory conditions, such as cryopyrin-associated periodic syndromes and other distinct periodic fevers (also known as hereditary periodic fevers). It is also approved in the EU for adult-onset Still's disease and the symptomatic treatment of refractory acute gouty arthritis. *Ilaris* is approved in one or more indications in approximately 70 countries worldwide.

Neuroscience

• *Gilenya* (fingolimod) is an oral disease-modifying therapy approved to treat relapsing forms of multiple sclerosis (MS). It has a reversible lymphocyte redistribution effect targeting both focal and diffuse central nervous system damage caused by MS. In the US, *Gilenya* is indicated for relapsing forms of MS in patients who are 10 years of age and older. In the EU, *Gilenya* is indicated for adult patients who have high disease activity despite treatment with at least one disease-modifying agent, or who have rapidly evolving severe relapsing-remitting MS. Additionally, it received European Commission approval in November 2018 for the treatment of children and adolescents with relapsing-remitting MS. Results from the Phase IIIb ASSESS study, announced in October 2018, showed that *Gilenya* 0.5 mg is superior in reducing relapses to glatiramer acetate in a controlled, head-to-head trial. Treatment with *Gilenya* 0.5 mg resulted in a 40.7% relative reduction in the rate of relapses over one year, compared to patients on glatiramer acetate 20 mg. Adults taking *Gilenya* 0.25 mg achieved a numerical risk reduction in relapses compared to the comparator, but did not reach statistical significance. *Gilenya* is currently approved in more than 80 countries around the world. *Gilenya* is licensed from Mitsubishi Tanabe Pharma Corporation.

• *Aimovig* (erenumab) is designed specifically to block the calcitonin gene-related peptide receptor (CGRP-R), which plays a critical role in migraine. It is the first FDA- and EMA-approved CGRP-targeted therapy for the prevention of migraine in adults. *Aimovig* received US approval in May 2018 and EU approval in July 2018, and is currently approved in 37 countries worldwide. *Aimovig* is co-commercialized with Amgen in the US, where Amgen records sales, and Novartis has exclusive commercialization rights for all territories excluding the US and Japan.

Respiratory

• *Xolair* (omalizumab) is approved for the treatment of moderate-to-severe, or severe, persistent allergic asthma in children (age 6 and older) and adults. It has been approved in more than 90 countries, including the US since 2003, the EU since 2005, Japan since 2009, and China since 2018. *Xolair* is provided as lyophilized powder for resolution, and as liquid formulation in a pre-filled syringe. In December 2018, the European Commission approved the *Xolair* pre-filled syringe for self-administration across all indications. (See also *Xolair* in "Immunology, Hepatology and Dermatology" above.) We co-promote *Xolair* with Genentech in the US and share a portion of operating income, but we do not record any US sales. Novartis records all sales of *Xolair* outside the US. For further information, see "Item 18. Financial Statements—Note 26. Transactions with related parties—Genentech/Roche."

Cardio-Metabolic

• *Entresto* (sacubitril/valsartan) is a first-in-class angiotensin receptor/neprilysin inhibitor indicated for the treatment of symptomatic chronic heart failure with reduced ejection fraction (HFrEF). It acts to enhance the protective neurohormonal systems of the heart (neprilysin system) while simultaneously suppressing the harmful system (the renin-angiotensin-aldosterone system, or RAAS). *Entresto* was approved in the US and in the EU in 2015. It is now approved in more than 100 countries and launched in more than 90 countries. Both European Society of Cardiology heart failure guidelines and US heart failure guidelines have given a Class I recommendation, the strongest class of recommendation, for the use of sacubitril/valsartan in patients with HFrEF.

Established Medicines

• *Galvus* (vildagliptin), an oral DPP-4 inhibitor, and *Eucreas*, a single-pill combination of vildagliptin and metformin, are indicated for the treatment of type 2 diabetes. The products were first approved in 2007. *Galvus* is currently approved in more than 130 countries, including EU member states, Japan (as *Equa*), Latin America and Asia-Pacific. *Eucreas* is currently approved in more than 125 countries. It was the first single-pill combination of a DPP-4 inhibitor and metformin approved in Japan (as *EquMet*) and Europe, and is marketed as *Galvus Met* in most non-EU countries. In the EU, *Galvus* received approval for expanded use as a second-line monotherapy for type 2 diabetes patients who cannot take metformin. The EU also approved *Galvus* in combination with insulin, with or without metformin, for type 2 diabetes when diet, exercise and a stable dose of insulin do not result in glycemic control, and in triple combination with metformin and a sulphonylurea (SU) for type 2 diabetes when diet and exercise plus dual therapy with vildagliptin and metformin do not provide adequate glycemic control. In 2017, *Galvus* was approved as an add-on to insulin and an add-on to SU treatment. *Galvus* and *Eucreas* are co-marketed by Merck KGaA as *Jalra* and

Jalra M, respectively, in some countries in Latin America.

• *Diovan* (valsartan), together with *Diovan HCT/Co-Diovan* (valsartan and hydrochlorothiazide), is an angiotensin II receptor blocker (ARB). *Diovan* is the only agent in its class approved to treat all of the following: patients with high blood pressure (including children 6 to 18 years old), high-risk heart attack survivors, and patients with heart failure. *Diovan* first launched in 1996 and is available in more than 120 countries; *Diovan HCT/Co-Diovan* first launched in 1997 and is available in more than 100 countries.

• *Exforge* (valsartan and amlodipine besylate) is a single-pill combination of the ARB *Diovan* and the calcium channel blocker amlodipine besylate. First approved for the treatment of high blood pressure in Switzerland in 2006, and in the US and EU in 2007, it is now

available in more than 100 countries. *Exforge HCT* (valsartan, amlodipine besylate and hydrochlorothiazide) is a single pill combining three widely prescribed high blood pressure treatments: an ARB, a calcium channel blocker and a diuretic (hydrochlorothiazide). *Exforge HCT* was approved in the EU and the US in 2009, and is now available in more than 75 countries.

• *Zortress/Certican* (everolimus) is an oral inhibitor of the mTOR pathway. *Zortress/Certican* is approved in countries including the US, EU member states and Japan for the prevention of organ rejection in adult patients at low to moderate immunological risk receiving an allogeneic kidney or liver transplant. Additionally, it is approved in EU member states and Japan for adult patients receiving a heart transplant. First approved in July 2003, *Zortress/Certican* is now available in more than 80 countries worldwide and is the only mTOR inhibitor approved for liver and heart transplants.

• *Neoral* (cyclosporine, USP Modified) is an immunosuppressant to prevent organ rejection following a kidney, liver or heart transplant. It is approved for use in lung transplant in many countries outside the US. This micro-emulsion formulation of cyclosporine is also indicated for treating certain autoimmune disorders, such as psoriasis and rheumatoid arthritis. First launched in 1995, *Neoral* is marketed in approximately 100 countries.

Compounds in development

The following table and paragraph summaries provide an overview of the key Innovative Medicines Division projects currently in the Confirmatory Development stage and may also describe certain projects in the Exploratory Development stage. Projects include those seeking to develop potential uses of new molecular entities as well as potential additional indications or new formulations for already marketed products. Changes to the selected development projects table are highlighted in the table below entitled “Projects added to and subtracted from the development table since 2017.”

Compounds and new indications in development are subject to required regulatory approvals and, in certain instances, contractual limitations. These compounds and indications are in various stages of development throughout the world. It may not be possible to obtain regulatory approval for any or all of the new compounds and new indications referred to in this Form 20-F in any country or in every country. See “—Regulation” for further information on the approval process.

The year that each project entered the current phase of development disclosed below reflects the year in which the decision to enter the phase was made. This may be different from the year in which the first patient received the first treatment in the related clinical trial. A reference to a project being in registration means that an application has been filed with a health authority for marketing approval.

Selected development projects

Project/ product	Common name	Mechanism of action	Potential indication/ disease area	Business franchise	Formulation/ route of administration	Year project entered current development phase	Planned filing dates/curre phase
ABL001	asciminib	BCR-ABL inhibitor	Chronic myeloid leukemia, 3rd line	Oncology	Oral	2016	2021/III
			Chronic myeloid leukemia, 1st line	Oncology	Oral	2017	≥2023/I
ACZ885	canakinumab	Anti-interleukin-1 beta monoclonal antibody	2nd line non-small cell lung cancer	Oncology	Subcutaneous injection	2017	2021/III
			1st line non-small cell lung cancer	Oncology	Subcutaneous injection	2017	2021/III
			Adjuvant non-small cell lung cancer	Oncology	Subcutaneous injection	2017	2022/III
AVXS-101 (*Zolgensma*)	onasemno-gene abepar-vovec-xxxx	Survival motor neuron (SMN) gene replacement therapy	Spinal muscular atrophy type 1 (IV formulation)	Neuroscience	Intravenous infusion	2018	US/EU registratio
			Spinal muscular atrophy type 2/3 (IT formulation)	Neuroscience	Intrathecal injection	2016	2020/I
AVXS-201	TBD	Methyl-CpG binding protein 2 (MECP2) gene replacement therapy	Rett syndrome	Neuroscience	Intrathecal injection	2018	2022/I
BAF312 (*Mayzent*)	siponimod	Sphingosine-1-phosphate receptor modulator	Secondary progressive multiple sclerosis	Neuroscience	Oral	2018	US/EU registratio
BYL719	alpelisib	PI3K-alpha inhibitor	Hormone receptor-positive (HR+)/human epidermal growth factor receptor 2-negative (HER2-) advanced breast cancer (postmenopausal women), 2nd line (+ fulvestrant)	Oncology	Oral	2018	US/EU registratio
CAD106	amilomotide	Beta-amyloid-protein therapy	Alzheimer's disease	Neuroscience	Intramuscular injection	2009	≥2023/II/I
CFZ533	iscalimab	Blocking, non-depleting, anti-CD40 monoclonal antibody	Solid organ transplantation	Immunology, Hepatology and Dermatology	Intravenous infusion	2017 2018	≥2023/II ≥2023/II

			Sjögren's syndrome	Immunology, Hepatology and Dermatology	Intravenous infusion		
CNP520	TBD	BACE inhibitor	Alzheimer's disease	Neuroscience	Oral	2016	≥2023/II/I
Cosentyx	secukinumab	Anti-interleukin-17 monoclonal antibody	Non-radiographic axial spondyloarthritis	Immunology, Hepatology and Dermatology	Subcutaneous injection	2015	2019/III
			Psoriatic arthritis head-to-head study versus Humira® (adalimumab)	Immunology, Hepatology and Dermatology	Subcutaneous injection	2015	2020/III
			Ankylosing spondylitis head-to-head study versus Sandoz biosimilar *Hyrimoz* (adalimumab)	Immunology, Hepatology and Dermatology	Subcutaneous injection	2015	2022/III
			Hidradenitis suppurativa	Immunology, Hepatology and Dermatology	Intravenous infusion	2017	2022/III
CSJ117	TBD	Anti-thymic stromal lymphopoietin monoclonal antibody fragment	Severe asthma	Respiratory	Inhalation	2018	≥2023/II
ECF843	TBD	Boundary lubricant	Dry eye	Ophthalmology	Eye drops	2017	2022/II
EMA401	olodanrigan	Angiotensin II type 2 receptor antagonist	Peripheral neuropathic pain	Neuroscience	Oral	2015	≥2023/II
Entresto	valsartan and sacubitril (as sodium salt complex)	Angiotensin receptor/ neprilysin inhibitor	Chronic heart failure with preserved ejection fraction	Cardio-Metabolic	Oral	2012	2019/III
			Post-acute myocardial infarction	Cardio-Metabolic	Oral	2015	2020/III
HDM201	TBD	p53-HDM2 inhibitor	Acute myeloid lymphoma	Oncology	Oral	2017	≥2023/II
INC280	capmatinib	c-MET inhibitor	Non-small cell lung cancer	Oncology	Oral	2014	2019/II
			Non-small cell lung cancer (EGFR mutation)	Oncology	Oral	2016	2022/II
Jakavi	ruxolitinib	JAK1/2 inhibitor	Acute graft-versus-host disease	Oncology	Oral	2016	2020/III
			Chronic graft-versus-host disease	Oncology	Oral	2016	2020/III
KAE609	cipargamin	PfATP4 inhibitor	Malaria		Oral	2012	≥2023/II

Established
Medicines

Project/ product	Common name	Mechanism of action	Potential indication/ disease area	Business franchise	Formulation/ route of administration	Year project entered current development phase	Planned filing dates/curr phase
KAF156	ganaplacide	Imidazolopiperazines derivative	Malaria	Established Medicines	Oral	2014	≥2023/II
Kisqali	ribociclib	CDK4/6 inhibitor	HR+/HER2- breast cancer (adjuvant)	Oncology	Oral	2018	≥2023/III
Kymriah	tisagen-lecleucel	CD19-targeted chimeric antigen receptor T-cell immunotherapy	Relapsed/refractory follicular lymphoma	Oncology	Intravenous infusion	2017	2021/II
			Chronic lymphocytic leukemia	Oncology	Intravenous infusion	2017	2022/II
			Relapsed/refractory diffuse large B-cell lymphoma in 1st relapse	Oncology	Intravenous infusion	2018	2021/III
			Relapsed/refractory diffuse large B-cell lymphoma (+ pembrolizumab)	Oncology	Intravenous infusion	2017	≥2023/I
LAM320	clofazimine	Mycobacterial DNA binding	Multidrug-resistant tuberculosis	Established Medicines	Oral	2016	2021/III
LCI699	osilodrostat	Cortisol synthesis inhibitor	Cushing's disease	Oncology	Oral	2018	EU registrati US 2019/
LJC242	tropifexor, cenicriviroc (in fixed-dose combination)	FXR agonist and CCR2/5 inhibitor	Nonalcoholic steatohepatitis	Immunology, Hepatology and Dermatology	Oral	2017	≥2023/II
LJN452	tropifexor	FXR agonist	Nonalcoholic steatohepatitis	Immunology, Hepatology and Dermatology	Oral	2015	≥2023/II
LMI070	branaplam	SMN2 RNA splicing modulator	Spinal muscular atrophy	Neuroscience	Oral	2017	≥2023/II
LNP023	TBD	Factor B inhibitor	IgA nephropathy	Cardio-Metabolic	Oral	2018	≥2023/II
			Membranous nephropathy	Cardio-Metabolic	Oral	2018	≥2023/II
LOU064	TBD	BTK inhibitor	Chronic spontaneous urticaria	Immunology, Hepatology and Dermatology	Oral	2017	≥2023/II
^{177}Lu-PSMA-617	TBD	Targeted DNA destruction via beta-particle radiation	Metastatic castration-resistant prostate cancer	Oncology	Intravenous infusion	2018	2020/III
Lucentis	ranibizumab	Anti-VEGF monoclonal antibody fragment	Retinopathy of prematurity	Ophthalmology	Intravitreal injection	2018	EU registrati

			Diabetic retinopathy	Ophthalmology	Intravitreal injection	2018	EU registratio
MOR106	TBD	Anti-interleukin-17C monoclonal antibody	Atopic dermatitis	Immunology, Hepatology and Dermatology	Subcutaneous injection	2018	≥2023/II
OMB157	ofatumumab	Anti-CD20 monoclonal antibody	Relapsing multiple sclerosis	Neuroscience	Subcutaneous injection	2015	2019/III
PDR001	spartalizumab	Anti-PD-1 monoclonal antibody	Metastatic BRAF V600+ melanoma (w/ *Tafinlar* + *Mekinist*)	Oncology	Intravenous infusion	2017	2019/III
			Malignant melanoma (combo)	Oncology	Intravenous infusion	2017	2022/II
Promacta/ Revolade	eltrombopag	Thrombopoietin receptor agonist	Severe aplastic anemia, 1st line	Oncology	Oral	2018	US appro EU registratio
QAW039	fevipiprant	DP2 antagonist (CRTH2 antagonist)	Asthma	Respiratory	Oral	2015	2020/III
QBW251	TBD	CFTR potentiator	Chronic obstructive pulmonary disease	Respiratory	Oral	2017	≥2023/II
QGE031	ligelizumab	High-affinity anti-IgE monoclonal antibody	Chronic spontaneous urticaria/ chronic idiopathic urticaria	Immunology, Hepatology and Dermatology	Subcutaneous injection	2017	2021/III
QMF149 44	indacaterol, mometasone furoate (in fixed-dose combination)	Long-acting beta$_2$-adrenergic agonist and inhaled corticosteroid	Asthma	Respiratory	Inhalation	2015	2019/III

Project/ product	Common name	Mechanism of action	Potential indication/ disease area	Business franchise	Formulation/ route of administration	Year project entered current development phase	Planned filing dates/current phase
QVM149	indacaterol, mometasone furoate, glyco-pyrronium bromide (in fixed-dose combination)	Long-acting beta$_2$-adrenergic agonist, long-acting muscarinic antagonist and inhaled corticosteroid	Asthma	Respiratory	Inhalation	2015	2019/III
RTH258	brolucizumab	Anti-VEGF single-chain antibody fragment	Neovascular age-related macular degeneration	Ophthalmology	Intravitreal injection	2014	2019/III
			Diabetic macular edema	Ophthalmology	Intravitreal injection	2017	2020/III
			Retinal vein occlusion	Ophthalmology	Intravitreal injection	2018	2022/III
Rydapt	midostaurin	Signal transduction inhibitor	Acute myeloid leukemia (FLT3 wild type)	Oncology	Oral	2016	2022/III
SEG101	crizanlizumab	P-selectin inhibitor	Sickle cell disease	Oncology	Intravenous infusion	2016	2019/II
UNR844	TBD	Reduction of disulfide bonds	Presbyopia	Ophthalmology	Eye drops	2017	2022/II
VAY736	lanalumab	Anti-BAFF (B-cell-activating factor) monoclonal antibody	Autoimmune hepatitis	Immunology, Hepatology and Dermatology	Subcutaneous injection	2016	≥2023/II
			Primary Sjögren's syndrome	Immunology, Hepatology and Dermatology	Subcutaneous injection	2015	≥2023/II
VAY785	emricasan	Pan-caspase inhibitor	Nonalcoholic steatohepatitis	Immunology, Hepatology and Dermatology	Oral	2017	≥2023/II
VPM087	TBD	Interleukin-1 beta neutralization monoclonal antibody	Colorectal cancer, 1st line; renal cell carcinoma, 1st line	Oncology	Intravenous infusion	2018	≥2023/I
Xolair	omalizumab		Nasal polyps	Respiratory		2017	2019/III

		Anti-IgE monoclonal antibody			Subcutaneous injection		
ZPL389	adriforant	Histamine H4 receptor antagonist	Atopic dermatitis	Immunology, Hepatology and Dermatology	Oral	2017	2022/II

Key development projects

• ACZ885 (canakinumab) was first approved as *Ilaris* in 2009 for cryopyrin-associated periodic syndromes. In 2017, data from CANTOS, a Phase III study evaluating quarterly injections of ACZ885 in people with a prior heart attack and inflammatory atherosclerosis, was presented at the European Society of Cardiology Congress and published simultaneously in The New England Journal of Medicine and The Lancet. A review of a blinded, pre-planned lung cancer safety analysis revealed a 77% reduction in lung cancer mortality and a 67% reduction in lung cancer cases in patients treated with 300 mg of ACZ885. As a result of these findings, Novartis has initiated three Phase III studies of ACZ885 in lung cancer, with data from primary analyses expected to report out in 2021. We received a complete response letter from the FDA in October 2018 regarding our supplemental Biologics License Application for ACZ885 in cardiovascular risk reduction.

• AVXS-101 (onasemnogene abeparvovec-xxxx, *Zolgensma*) is a gene replacement therapy candidate designed to address the genetic root cause of spinal muscular atrophy (SMA), a progressive neuromuscular disease and the leading cause of genetic mortality in infants globally. In December 2018, we announced that the FDA accepted the Biologics License Application for *Zolgensma* for the treatment of SMA type 1, the most severe form of the disease. Delivered as a single, one-time infusion, *Zolgensma* works by replacing the missing or defective SMN1 gene with a functional copy that makes the SMN protein, thereby improving motor neuron function and survival. The Biologics License Application filing is supported by data from the Phase I START trial, which demonstrated an increase in survival and improved achievement of developmental milestones compared to the natural history of SMA type 1. *Zolgensma* is currently being studied in a Phase III trial in patients with SMA type 1 in the US (STR1VE) and in Europe (STR1VE-EU), with a planned Phase III study in the Asia-Pacific region (STR1VE-AP). *Zolgensma* is also being studied in a Phase I trial in the US in patients with SMA type 2 (STRONG), and in a Phase III multinational trial in presymptomatic patients with SMA with two or three copies of the SMN2 gene (SPR1NT). A trial in pediatric patients with SMA types 1, 2 and 3 (REACH) is planned for 2019. Patients from the START trial had the option to voluntarily enroll in a long-term, 15-year observational follow-up study. The brand name *Zolgensma* has been provisionally approved by the FDA for AVXS-101, but the product itself has not received marketing authorization or Biologics License Application approval from any regulatory authorities.

• BAF312 (siponimod, *Mayzent*) is an oral, second-generation sphingosine-1-phosphate (S1P) receptor modulator under development for the treatment of secondary progressive multiple sclerosis (SPMS). It binds selectively to the S1P receptor subtypes 1 and 5, and penetrates effectively to the central nervous system, where it may impact central nervous system inflammation and repair mechanisms. Results from the EXPAND Phase III study, evaluating efficacy and safety for SPMS, demonstrated that *Mayzent* reduced three- and six-month confirmed disability progression against placebo, with a safety profile similar to other S1P1 receptor modulators. The full results from the Phase III EXPAND study of oral, once-daily *Mayzent* in SPMS were published in The Lancet in March 2018. Further analyses from the EXPAND study presented in April 2018 at the American Academy of Neurology showed that the efficacy of *Mayzent* on disability was largely independent from relapse activity in SPMS. The analyses also revealed positive data on cognitive decline. In October 2018, we announced that both the FDA and EMA had accepted our New Drug Application and Marketing Authorization Application, respectively, for review. Submissions are now also underway in Japan and China. If approved, label content will be subject to negotiation with regulatory authorities, but it is expected to reflect the typical SPMS population studied in the EXPAND trial. The brand name *Mayzent* has been provisionally approved by the FDA and EMA for BAF312, but the product itself has not been approved for sale in any country.
• BYL719 (alpelisib) is an investigational, orally bioavailable, alpha-specific PI3K inhibitor. In breast cancer cell lines harboring PIK3CA mutations, BYL719 has been shown to potentially inhibit the PI3K pathway and have antiproliferative effects. In addition, cancer cell lines with PIK3CA mutations were more sensitive to BYL719 than those without the mutation across a broad range of different cancers. At ESMO 2018, positive results from the global Phase III SOLAR-1 trial evaluating BYL719 in combination with fulvestrant were presented. In patients with PIK3CA-mutated HR+/HER2- advanced breast cancer, BYL719 plus fulvestrant nearly doubled median progression-free survival compared to fulvestrant alone. Novartis is also conducting the Phase II open-label BYLieve trial evaluating BYL719 plus fulvestrant or letrozole in patients with PIK3CA-mutated HR+/HER2- advanced breast cancer who have progressed on prior therapy. The study investigates BYL719 in a broader patient population as compared with SOLAR-1, including two cohorts exclusively enrolling patients who have progressed on or after prior CDK4/6 inhibitor therapies.
• *Cosentyx* (secukinumab) is a fully human monoclonal antibody that selectively neutralizes interleukin-17A (IL-17A). *Cosentyx* is in Phase III development in non-radiographic axial spondyloarthritis. We expect results from this trial in 2019. *Cosentyx* is also in a Phase III head-to-head clinical trial in psoriatic arthritis against Humira® (adalimumab), and a Phase III head-to-head clinical trial in ankylosing spondylitis against the Sandoz biosimilar *Hyrimoz* (adalimumab).
• *Entresto* (sacubitril/valsartan) is a first-in-class angiotensin receptor/neprilysin inhibitor approved and marketed for the treatment of chronic heart failure with reduced ejection fraction (HFrEF). Novartis is conducting multiple studies of *Entresto* as part of the FortiHFy clinical program. FortiHFy includes studies to provide reinforcing evidence in HFrEF, such as PIONEER-HF and TRANSITION, which both read out in 2018 and confirmed safety as well as superiority of *Entresto* versus enalapril, an angiotensin-converting enzyme inhibitor (ACE inhibitor), in the hospital setting in a wide range of HFrEF patients hemodynamically stabilized after an acute decompensated heart failure event. FortiHFy also includes studies to investigate *Entresto* use in novel indications and expanded patient populations. These include PARAGON-HF and PARALLAX-HF, Phase III trials of *Entresto* in patients with chronic heart failure with preserved ejection fraction (PARAGON-HF enrollment is completed and results are expected in 2019, while PARALLAX-HF enrollment is ongoing and results are expected in 2020); PARADISE-MI, a Phase III trial for patients at high risk for heart failure after an acute myocardial infarction (enrollment is ongoing and results are expected in 2020); PARALLEL-HF, a Phase III trial in Japan for patients with HFrEF (enrollment is completed and results are expected in 2019); and PANORAMA-HF, a Phase III trial for pediatric patients with heart failure (enrollment is ongoing and results are expected in 2021).
• INC280 (capmatinib) is an investigational, oral and selective MET inhibitor currently in a Phase II study in adult patients with advanced non-small cell lung cancer harboring MET exon 14 skipping mutations, as well as additional early-stage studies in combination with other compounds. In October 2018, Novartis presented preliminary results of the Phase II study at the European Society of Medical Oncology congress. INC280 is licensed by Novartis from Incyte Corporation. Under the licensing agreement, Incyte granted Novartis exclusive worldwide development and commercialization rights to this MET inhibitor compound.

• KAF156 (ganaplacide) belongs to a novel class of antimalarial compounds called imidazolopiperazines. It has the potential to clear malaria infection, including resistant strains, and to block the transmission of the malaria parasite. As demonstrated in a Phase IIa proof-of-concept trial, the compound is fast-acting and potent across multiple stages of the parasite's lifecycle, rapidly clearing both Plasmodium falciparum and Plasmodium vivax parasites. In August 2017, Novartis began a Phase IIb study to test multiple dosing combinations and dosing schedules of KAF156 and lumefantrine, including the feasibility of a single dose therapy in adults, adolescents and children.
• *Kisqali* (ribociclib) is a selective cyclin-dependent kinase inhibitor that inhibits two proteins called cyclin-dependent kinase 4 and 6 (CDK4/6). Novartis is continuing to assess *Kisqali* through the MONALEESA clinical trial program, which includes MONALEESA-2, MONALEESA-3 and MONALEESA-7, as well as the NataLEE adjuvant trial. These trials are

evaluating *Kisqali* in multiple endocrine therapy combinations across a broad range of patients, including men and premenopausal women. *Kisqali* was developed by Novartis as part of a drug discovery collaboration with Astex Pharmaceuticals.

• *Kymriah* (tisagenlecleucel) is a CD19-directed genetically modified autologous chimeric antigen receptor T-cell (CAR-T) therapy that uses the patient's own immune system to fight certain types of cancer. CARs are engineered proteins that enable a patient's own T-cells to seek out specific target proteins present on a patient's cancerous cells. When these cells are reintroduced into the patient's blood, they demonstrate the potential to bind to the cancer cells and destroy them. *Kymriah* targets a protein called CD19, which is associated with a number of B-cell malignancies. Novartis is starting pivotal clinical studies of *Kymriah* in relapsed or refractory (r/r) follicular lymphoma, adult r/r acute lymphoblastic leukemia (ALL), first-line high-risk pediatric ALL, diffuse large B-cell lymphoma after first relapse, and r/r chronic lymphoblastic leukemia. Novartis and the University of Pennsylvania's Perelman School of Medicine, which developed *Kymriah*, have a global collaboration to research, develop and commercialize CAR-T therapies, including *Kymriah*, for the investigational treatment of cancers.

• LJN452 (tropifexor) is a potent, non-bile acid, farnesoid X receptor (FXR) agonist that is being developed for the treatment of nonalcoholic steatohepatitis (NASH). LJN452 has been shown to reduce steatosis, inflammation and fibrosis in animal models, alongside a favorable safety profile in first-in-human studies. This oral treatment is designed to break the cycle of fatty buildup in the liver and harness the body's built-in mechanisms for coping with excess bile acid. Recruitment is underway for the first LJN452 clinical study with histological endpoints in NASH patients.

• OMB157 (ofatumumab) is a fully human monoclonal antibody administered by subcutaneous injection. It is in development for multiple sclerosis (MS). OMB157 works by binding to the CD20 molecule on the B-cell surface and inducing B-cell depletion. Positive Phase IIb results in MS patients were presented in 2014 and showed significant reduction in the number of new brain lesions in the first 24 weeks after OMB157 administration. Novartis initiated a Phase III program for OMB157 in relapsing MS in August 2016. The program is fully enrolled and is on track for completion in 2019. In addition, a registration study for Japan was initiated in March 2018.

• PDR001 (spartalizumab) is an investigational PD-1 antagonist that may restore the ability of immune cells to induce cell death and fight cancer. PDR001 is being evaluated in a Phase III trial in combination with *Tafinlar* + *Mekinist* for metastatic BRAF V600+ melanoma, and in combination in other clinical trials across different tumor types.

• QAW039 (fevipiprant) is a once-daily oral therapy that blocks the DP2 pathway, a principal regulator of the inflammatory cascade. By targeting the DP2 pathway, QAW039 blocks the asthma inflammatory cascade at multiple points. In asthma, this results in the reduction of eosinophil activation and migration; in the reduced release of pro-inflammatory cytokines IL-4, IL-5 and IL-13; and in the reduction of smooth muscle cell mass in the airways. Positive Phase II results showed improvement of lung function, reduction of sputum eosinophil levels, and improvement of asthma symptoms. Phase III studies are ongoing, measuring improvement of lung function and reduction of asthma attacks in moderate to severe patients with unresolved asthma despite treatment with inhaled therapies. Phase III development started in 2015, with first pivotal trial readouts expected this year.

• QVM149 (indacaterol acetate, glycopyrronium bromide, mometasone furoate) is a fixed-dose combination of indacaterol acetate (an inhaled long-acting beta2-adrenergic agonist), glycopyrronium bromide (an inhaled long-acting muscarinic antagonist), and mometasone furoate (an inhaled corticosteroid) delivered once-daily via the *Breezhaler* device, a unit dose dry powder inhaler. It is in development as a maintenance treatment for poorly controlled asthmatic patients. All three mono-components have previously been developed as individual drugs for either chronic obstructive pulmonary disease or asthma. QVM149 is currently in Phase III clinical trials to support registration outside the US.

• RTH258 (brolucizumab) is a single-chain antibody fragment that acts as an anti-vascular endothelial growth factor (anti-VEGF) agent. RTH258 is currently in development for neovascular age-related macular degeneration (nAMD) and diabetic macular edema. In nAMD, RTH258 met its primary endpoint of non-inferiority to aflibercept in mean change in best-corrected visual acuity in two Phase III clinical trials, HAWK and HARRIER. Additionally, superiority was shown in three secondary endpoints that are considered key markers of nAMD disease: central subfield retinal thickness, retinal fluid (intraretinal and subretinal), and disease activity. A majority of patients were maintained on a 12-week treatment schedule immediately following the loading phase to Week 48, also assessed by secondary endpoints in the HAWK and HARRIER trials. Year Two data reaffirmed the Year One findings. We expect to make

global regulatory filings for nAMD, starting in the US, the EU and Japan.

• SEG101 (crizanlizumab) is an investigational humanized anti-P-selectin monoclonal antibody that is in late-stage development for the prevention of vaso-occlusive pain crises (VOCs) in patients with sickle cell disease (SCD). SCD is a debilitating genetic blood disorder that affects the shape of red blood cells and can cause VOCs. In December 2018, the FDA granted SEG101 breakthrough therapy designation for the prevention of vaso-occlusive crises in sickle cell disease.

• UNR844 is a potential first-in-class topical treatment in development for presbyopia. It is believed to work through the reduction of disulfide bonds, softening the

crystalline lens. Presbyopia is a common age-related loss of near-distance vision characterized by a progressive inability to focus on objects nearby, making everyday activities (such as reading) a challenge. In a Phase I/II masked, placebo-controlled proof-of-concept study, 50 patients were treated daily for 90 days with topical UNR844, and 25 patients were treated with placebo. UNR844 showed a statistically significant difference to placebo in distance-corrected near vision at all time points measured (from Day Eight). At Day 90, 82% of participants treated with UNR844 had 20/40 near vision (or 0.30 LogMAR) versus 48% in the placebo group. Near vision of 20/40 allows for the majority of near-vision tasks in most people. UNR844 was acquired by Novartis through the acquisition of Encore Vision, Inc. in January 2017.

Projects added to and subtracted from the development table since 2017

Project/product	Potential indication/disease area	Change	Reason
ACZ885	Secondary prevention of cardiovascular events	Removed	Development discontinued
Afinitor/Votubia	Tuberous sclerosis complex seizures	Commercialized	
AMG 334	Prophylaxis of migraine	Commercialized as *Aimovig*	
Arzerra	Refractory indolent non-Hodgkin's lymphoma	Removed	Development discontinued
AVXS-101 (*Zolgensma*)	Spinal muscular atrophy type 1 (IV formulation)	Added	Acquired with acquisition of AveXis, Inc.
	Spinal muscular atrophy type 2/3 (IT formulation)	Added	Acquired with acquisition of AveXis, Inc.
AVXS-201	Rett syndrome	Added	Acquired with acquisition of AveXis, Inc.
BYM338	Hip fracture recovery	Removed	Development discontinued
	Sarcopenia	Removed	Development discontinued
CFZ533	Sjögren's syndrome	Added	Entered Confirmatory Development
Cosentyx	Hidradenitis suppurativa	Added	Entered Confirmatory Development
CSJ117	Severe asthma	Added	Entered Confirmatory Development
EGF816	Non-small cell lung cancer	Removed	Development discontinued
Gilenya	Pediatric multiple sclerosis	Commercialized	
Kisqali	HR+/HER2- advanced breast cancer (postmenopausal women), 1st/2nd line (+ fulvestrant)	Commercialized	
	HR+/HER2- advanced breast cancer (premenopausal women), 1st line (+ tamoxifen + goserelin or NSAI + goserelin)	Commercialized	
Kymriah (CTL019)	Pediatric/young adult acute lymphoblastic leukemia	Commercialized	
		Commercialized	

	Relapsed/refractory diffuse large B-cell lymphoma		
LHW090	Resistant hypertension	Removed	Development discontinued
LIK066	Weight loss	Removed	Development discontinued
LJC242	Nonalcoholic steatohepatitis	Added	Entered Confirmatory Development
LNP023	IgA nephropathy	Added	Entered Confirmatory Development
	Membranous nephropathy	Added	Entered Confirmatory Development
^{177}Lu-PSMA-617	Metastatic castration-resistant prostate cancer	Added	Acquired with acquisition of Endocyte
Lucentis	Diabetic retinopathy	Added	Entered Confirmatory Development
MAA868	Stroke prevention in atrial fibrillation	Removed	Development discontinued
MOR106	Atopic dermatitis	Added	Entered Confirmatory Development
MTV273	Multiple myeloma	Removed	Development discontinued
PDR001	Malignant melanoma (w/ *Tafinlar* + *Mekinist*)	Now disclosed as metastatic BRAF V600+ melanoma (w/ *Tafinlar* + *Mekinist*)	
	Endocrine neoplasm	Removed	Development discontinued
	Malignant melanoma	Now disclosed as malignant melanoma (combo)	
RTH258	Retinal vein occlusion	Added	Entered Confirmatory Development
Signifor LAR	Cushing's disease	Commercialized	
Tafinlar + *Mekinist*	BRAF V600+ melanoma (adjuvant)	Commercialized	
VPM087	Colorectal cancer, 1st line; renal cell carcinoma, 1st line	Added	Entered Confirmatory Development

Principal markets

The Innovative Medicines Division sells products in approximately 155 countries worldwide. Net sales are generally concentrated in the US, Europe, Japan and China. The following table sets forth the aggregate 2018 net sales of the Innovative Medicines Division by region:

Innovative Medicines

	2018 net sales to third parties	
	USD millions	%
Europe	12 296	35
United States	11 864	34
Asia, Africa, Australasia	8 097	23
Canada and Latin America	2 635	8
Total	34 892	100
Of which in Established Markets *	26 258	75
Of which in Emerging Growth Markets *	8 634	25

* Emerging Growth Markets comprise all markets other than the Established Markets of the US, Canada, Western Europe, Japan, Australia and New Zealand.

Many of our Innovative Medicines Division products are used for chronic conditions that require patients to consume the product over long periods of time, ranging from months to years. However, certain of our marketed products and development projects, such as gene therapies, are administered only once. Net sales of the vast majority of our products are not subject to material changes in seasonal demand.

Production

The primary goal of our manufacturing and supply chain management program is to ensure the uninterrupted, timely and cost-effective supply of products that meet all product specifications and quality standards. The manufacture of our products is heavily regulated by governmental health authorities around the world, including the FDA and EMA. In addition to regulatory requirements, many of our products involve technically complex manufacturing processes or require a supply of highly specialized raw materials.

We manufacture our products at facilities worldwide. See also “—Item 4.D Property, plants and equipment.” Active pharmaceutical ingredients are manufactured in our own facilities or purchased from third-party suppliers. We maintain state-of-the-art processes, with quality as a primary goal within our own production network. Those processes include fermentation, chemical syntheses and precipitation processes, such as sterile processing. Many biologic medicines are manufactured using recombinant DNA-derived technology, by which a gene is introduced into a host cell, which then produces a human protein. This manufacturing process requires sophisticated technical expertise. We are constantly working to improve current, and to develop new, manufacturing processes, and to review and adapt our manufacturing network to meet the needs of our Innovative Medicines Division.

Raw materials for the manufacturing process are either produced in-house or purchased from a number of third-party suppliers. Where possible, we maintain multiple supply sources so that the business is not dependent on a single or limited number of suppliers. However, our ability to do so may at times be limited by regulatory or other requirements. We monitor market developments that could have an adverse effect on the supply of essential materials. Our suppliers of raw materials are required to comply with Novartis quality standards.

Because the manufacture of our products is complex and heavily regulated by governmental health authorities, supply is never guaranteed. If we or our third-party suppliers fail to comply with applicable regulations, then there could be a product recall or other shutdown or disruption of our production activities. We have experienced supply interruptions for our products in the past, and there can be no assurance that supply will not be interrupted again in the future. We have implemented a global manufacturing strategy to maximize business continuity in case of such events. However, there can be no guarantee that we will always be able to successfully manage such issues when they arise.

Marketing and sales

The Innovative Medicines Division serves customers with 25 783 field force representatives, as of December 31, 2018, including supervisors and administrative personnel. These trained representatives present the therapeutic risks and benefits of our products to physicians, pharmacists, hospitals, insurance groups, managed care organizations and other healthcare professionals. We continue to see increasing influence of customer groups beyond prescribers, and

Novartis is responding by adapting our business practices to engage appropriately with such constituencies. The marketplace for healthcare is also evolving, with patients becoming more informed stakeholders in their healthcare decisions and looking for solutions to meet their changing needs. Novartis seeks to support the

patient, delivering innovative solutions to drive education, access and improved patient care. Additionally, in the US, certain products can be advertised by way of internet, television, newspaper and magazine advertising.

Although specific distribution patterns vary by country, Novartis generally sells its prescription drugs primarily to wholesale and retail drug distributors, hospitals, clinics, government agencies and managed healthcare providers. The growing number of so-called “specialty” drugs in our portfolio has resulted in increased engagement with specialty pharmacies. In the US, specialty pharmacies continue to grow as a distribution channel for specialty products, with an increasing number of health plans mandating use of specialty pharmacies to monitor specialty drug utilization and costs.

Novartis pursues co-promotion/co-marketing opportunities as well as licensing and distribution agreements with other companies in various markets, when economically attractive.

As a result of continuing changes in healthcare economics and an aging population, the US Centers for Medicare & Medicaid Services (CMS) is the largest single payer for healthcare services in the US. In addition, both commercial and government-sponsored managed care organizations continue to be among the largest groups of payers for healthcare services in the US. In other countries, national health services are often the only significant payer for healthcare services. In an effort to control prescription drug costs, almost all managed care organizations and national health services use formularies that list specific drugs that may be reimbursed and/or the level of reimbursement for each drug. Managed care organizations and national health services also increasingly utilize various cost-benefit analyses to determine whether or not newly approved drugs will be added to a formulary and/or the level of reimbursement for that drug, and to determine whether or not to continue to reimburse existing drugs. We have dedicated teams that actively seek to optimize patient access, including formulary positions, for our products.

Recent trends have been toward continued consolidation among distributors and retailers of Innovative Medicines Division products, both in the US and internationally. This has increased our customers’ purchasing leverage and resulted in increased pricing pressure on our products. Moreover, we are exposed to increased concentration of credit risk as a result of the consolidation among our customers.

Competition

The global pharmaceutical market is highly competitive, and we compete against other major international corporations that have substantial financial and other resources, as well as against smaller companies that operate regionally or nationally. Competition within the industry is intense and extends across a wide range of activities, including pricing, product characteristics, customer service, sales and marketing, and research and development.

In addition, as is the case with other pharmaceutical companies selling patented pharmaceuticals, Novartis faces ever-increasing challenges from companies selling products that compete with our products, including competing patented products and generic forms of our products following the expiry of intellectual property protection. Generic companies may also gain entry to the market through successfully challenging our intellectual property rights, but we vigorously use legally permissible measures to defend those rights. See also “—Intellectual property” below. We also may face competition from over-the-counter (OTC) products that do not require a prescription from a physician. See also “—Regulation—Price controls” below.

There is ongoing consolidation in the pharmaceutical industry. At the same time, new entrants are looking to use their expertise to establish or expand their presence in healthcare, including technology companies hoping to benefit as data and data management become increasingly important in our industry.

Research and development

The discovery and development of a new drug is a lengthy process, usually requiring approximately 10 to 15 years from the initial research to bringing a drug to market, including approximately six to eight years from Phase I clinical trials to market entry. At each of these steps, there is a substantial risk that a compound will not meet the requirements to progress further. In such an event, we may be required to abandon a compound in which we have made a substantial investment.

We manage our research and development expenditures across our entire portfolio in accordance with our strategic priorities. We make decisions about whether or not to proceed with development projects on a project-by-project basis. These decisions are based on the project’s potential to meet a significant unmet medical need or to improve patient outcomes, the strength of the science underlying the project, and the potential of the project (subject to the risks inherent in pharmaceutical development) to generate significant positive financial results for the Company. Once a management decision has been made to proceed with the development of a particular molecule, the level of research

and development investment required will be driven by many factors, including the medical indications for which it is being developed, the number of indications being pursued, whether the molecule is of a chemical or biological nature, the stage of development, and the level of evidence necessary to demonstrate clinical efficacy and safety.

Research program

Our research program is conducted by the Novartis Institutes for BioMedical Research (NIBR), which was established in 2002 and is the research and early development innovation engine of Novartis. NIBR is responsible for the discovery of new medicines for diseases with unmet medical need. We focus our work in areas where we believe we can have the most impact for patients. This requires the hiring and retention of extraordinary talent, a focus on fundamental disease mechanisms that are relevant across different disease areas, continuous improvement in technologies for drug discovery and

potential therapies, close alliances with clinical colleagues, and the establishment of strategic external alliances.
At NIBR sites in Basel, Switzerland; Cambridge, Massachusetts; East Hanover, New Jersey; San Diego, California; Emeryville, California; and Shanghai, China, approximately 6 000 full-time equivalent scientists, physicians and business professionals contribute to research into disease areas such as cardiovascular and metabolic diseases, neuroscience, oncology, muscle disorders, ophthalmology, autoimmune diseases and respiratory diseases. Research at the Friedrich Miescher Institute and the Genomics Institute of the Novartis Research Foundation focuses on basic genetic and genomic research, and the Novartis Institute for Tropical Diseases (NITD), located in Emeryville, California, focuses on discovering new medicines to fight tropical diseases, including malaria and cryptosporidiosis.
All drug candidates are taken to the clinic via proof-of-concept trials to enable an early assessment of the safety and efficacy of the drug while collecting basic information on pharmacokinetics and tolerability, and adhering to the guidance for early clinical testing set forth by health authorities. Following proof of concept, our Global Drug Development unit conducts confirmatory trials on the drug candidates.
In July 2018, we announced the decision to exit antibacterial and antiviral research. While the science for these programs is compelling, we have decided to prioritize our resources in other areas where we believe we are better positioned to develop innovative medicines that will have a positive impact for patients. The San Francisco Bay Area will continue to be home to NITD and global drug discovery teams focused on “undruggable” targets in collaboration with the Novartis-Berkeley Center for Proteomics and Chemistry Technologies. The need for new types of medicines to combat antimicrobial resistance is clear, and following the announcement, we began to explore out-licensing opportunities for compounds within our infectious diseases portfolio.
Development program
Our Global Drug Development (GDD) organization oversees drug development activities for our Innovative Medicines Division. GDD works collaboratively with NIBR to execute our overall pipeline strategy and takes an enterprise approach to pipeline portfolio management. The GDD organization includes centralized global functions such as Regulatory Affairs and Global Development Operations, and Global Development units aligned with our business franchises. GDD was created to improve resource allocation, technology implementation and process standardization to further increase innovation. GDD includes approximately 11 000 full-time equivalent associates worldwide.
Under our Global Drug Development unit, the focus of our development program is to determine and then establish the safety and efficacy of a potential new medicine in humans.
The traditional model of development comprises three phases, which are defined as follows:
Phase I: The first clinical trials of a new compound – generally performed in a small number of healthy human volunteers – to assess the drug’s safety profile, including the safe dosage range. These trials also determine how a drug is absorbed, distributed, metabolized and excreted, and the duration of its action.
Phase II: Clinical studies performed with patients who have the target disease, with the aim of continuing the Phase I safety assessment in a larger group, assessing the efficacy of the drug in the patient population, and determining the appropriate doses for further evaluation.
Phase III: Large-scale clinical studies with several hundred to several thousand patients, which are conducted to establish the safety and efficacy of the drug in specific indications for regulatory approval. Phase III trials may also be used to compare a new drug against a current standard of care to evaluate the overall benefit-risk relationship of the new medicine.
In each of these phases, physicians monitor volunteer patients closely to assess the potential new drug’s safety and efficacy.
Though we use this traditional model as a platform, we have tailored the development process to be simpler, more flexible and efficient. We view the development process as generally consisting of Exploratory Development where proof of concept is established, and Confirmatory Development where this concept is confirmed in large numbers of patients. Exploratory Development consists of clinical proof-of-concept (PoC) studies, which are small clinical trials (typically involving five to 15 patients) that combine elements of traditional Phase I/II testing. These customized trials are designed to give early insights into issues such as safety, efficacy and toxicity for a drug in a given indication and are conducted by NIBR. Once a positive proof of concept has been established, the drug moves to the Confirmatory Development stage and becomes the responsibility of GDD. Confirmatory Development has elements of traditional Phase II/III testing and includes trials aimed at confirming the safety and efficacy of the drug in the given indication,

leading up to submission of a dossier to health authorities for approval. This stage can also include trials that compare the drug to the current standard of care for the disease in order to evaluate the drug's overall risk-benefit profile. Further, with new treatment approaches such as gene therapy, elements of Exploratory and Confirmatory Development may be combined.

The vast amount of data that must be collected and evaluated makes clinical testing the most time-consuming and expensive part of new drug development. The next stage in the drug development process is to seek registration for the new drug. For more information, see "—Regulation."

At each phase of clinical development, our activities are managed by our Innovation Management Board (IMB). The IMB is responsible for oversight over all major aspects of our development portfolio and oversees our drug development budget. In particular, the IMB is responsible for the endorsement of proposals to commence the first clinical trials of a development compound, and of major project phase transitions and milestones following a positive proof-of-concept outcome, including transitions to full development and the decision to submit a regulatory application to the health authorities. The IMB is also responsible for project

discontinuations, the endorsement of overall development strategy, and the endorsement of development project priorities. The IMB is chaired by our Chief Executive Officer and has representatives from Novartis senior management with expertise spanning multiple fields, among its core members and extended membership.

Alliances and acquisitions

Our Innovative Medicines Division enters into business development agreements with other pharmaceutical and biotechnology companies and with academic and other institutions to develop new products and access new markets. We license products that complement our current product line and are appropriate to our business strategy. Therapeutic area strategies have been established to focus on alliances and acquisition activities for key disease areas and indications that are expected to be growth drivers in the future. We review products and compounds we are considering licensing, using the same criteria that we use for our own internally discovered drugs.

On December 21, 2018, we completed our acquisition of Endocyte, a US-based biopharmaceutical company focused on developing targeted therapeutics for cancer treatment. This acquisition expanded our radioligand therapy platform and added ^{177}Lu-PSMA-617 – a potential first-in-class radioligand therapy in Phase III development for metastatic, PSMA-positive castration-resistant prostate cancer – as well as other investigational treatments.

In December 2018, we announced an offer to acquire Cell*for*Cure, a French company that is one of the largest contract development and manufacturing organizations producing cell and gene therapies in Europe. This proposed acquisition builds on an existing agreement with Cell*for*Cure to produce CAR-T therapies, including *Kymriah* (tisagenlecleucel). If completed, the acquisition would bolster our CAR-T therapy manufacturing capacity with the potential to expand to other cell and gene therapies in the Novartis pipeline. This transaction is subject to customary closing conditions, including regulatory approval. For additional information, see “Item 18. Financial Statements—Note 2. Significant transactions—Significant pending transactions.”

In October 2018, we licensed three of our infectious disease programs, with the potential to address the need for new approaches to treat antibiotic-resistant Gram-negative infections, to Boston Pharmaceuticals. This agreement is part of our strategy to collaborate with external innovators to further develop new medicines that fall outside of our strategic direction but have the potential to have a positive impact on the lives of patients.

In August 2018, we closed an agreement with pharmaceutical company Mylan. Under the agreement, Mylan purchased the worldwide rights to commercialize our cystic fibrosis products *TOBI* solution and *TOBI Podhaler*.

In July 2018, we announced an exclusive license agreement with biotech companies Galapagos NV and MorphoSys AG regarding their compound MOR106. Under the agreement, Novartis acquires the exclusive global development and marketing rights to MOR106 for atopic dermatitis and all other potential indications. This transaction became effective on September 10, 2018.

In May 2018, we successfully completed the acquisition of AveXis, Inc., a US-based clinical stage gene therapy company. AveXis has several ongoing clinical studies for the treatment of spinal muscular atrophy (SMA), an inherited neurodegenerative disease. The lead AveXis gene therapy candidate, AVXS-101, has the potential to be the first-ever one-time gene replacement therapy for SMA. For additional information, see “Item 18. Financial Statements—Note 2. Significant transactions—Significant transactions in 2018.”

In March 2018, we announced a collaboration and licensing agreement with the Wyss Institute for Biologically Inspired Engineering at Harvard University and the Dana-Farber Cancer Institute to develop biomaterial systems for our portfolio of immuno-oncology therapies. The implantable and injectable systems aim to overcome barriers to success that have faced traditional cancer vaccines. The work will combine Harvard’s expertise in tumor biology and materials science with our diverse immuno-oncology pipeline.

In March 2018, we announced a collaboration with Pear Therapeutics to develop novel prescription digital therapeutics for patients with schizophrenia and multiple sclerosis. Under the agreement, we are working with Pear Therapeutics to advance clinical development of the Pear-004 prescription digital therapeutic for patients with schizophrenia. We will also work together on the design and development of a new prescription digital therapeutic to address underserved mental health burden in multiple sclerosis patients.

In January 2018, we announced a licensing agreement and a manufacturing and supply agreement with Spark Therapeutics covering development, registration and commercialization rights to *Luxturna* (voretigene neparvovec) in markets outside the US. *Luxturna* received FDA approval in December 2017 as a one-time gene therapy to restore functional vision in children and adult patients with biallelic mutations of the RPE65 gene, which typically lead to blindness. *Luxturna* was approved in the EU in November 2018.

On January 19, 2018, we successfully completed a tender offer for all of the then-outstanding ordinary shares, including ordinary shares represented by American Depositary Shares (ADSs), of Advanced Accelerator Applications S.A. (AAA). In addition, we commenced a subsequent offering period that expired on January 31, 2018. As of December 31, 2018, Novartis held 99.1% of the then outstanding fully-diluted ordinary shares, including ordinary shares represented by ADSs, which were validly tendered during the initial offering period, the subsequent offering period, and afterward. AAA is a radiopharmaceutical company headquartered in Saint-Genis-Pouilly, France, that develops, produces and commercializes nuclear medicines – including *Lutathera* (USAN: lutetium Lu 177 dotatate/INN: lutetium (^{177}Lu) oxodotreotide), a first-in-class radioligand therapy for gastroenteropancreatic neuroendocrine tumors – and diagnostic products. For additional information, see “Item 18. Financial Statements—Note 2. Significant transactions—Significant transactions in 2018.”

In November 2017, we announced an expanded collaboration with Amgen Inc. and Banner Alzheimer’s Institute to collaborate on a new Generation Study 2 to assess whether investigational BACE1 inhibitor CNP520

can prevent or delay the symptoms of Alzheimer's disease in a high-risk population.

In September 2017, we announced a collaboration agreement with the University of California, Berkeley, in the field of covalent chemoproteomics to establish the Novartis-Berkeley Center for Proteomics and Chemistry Technologies, based at Berkeley. The collaboration focuses on discovery of drug targets on proteins inaccessible to conventional therapeutic molecules.

In June 2017, we announced a clinical research collaboration in which Bristol-Myers Squibb is to investigate the safety, tolerability and efficacy of *Mekinist* (trametinib) in combination with Opdivo® (nivolumab) and Opdivo® + Yervoy® (ipilimumab) regimen as a potential treatment option for metastatic colorectal cancer in patients with microsatellite stable tumors where the tumors are proficient in mismatch repair (MSS mCRC pMMR).

In April 2017, we announced an expanded collaboration agreement with Amgen to co-commercialize *Aimovig* (erenumab) in the US. *Aimovig*, formerly known as AMG 334, was approved for the prevention of migraine. Under the agreement, Novartis retained exclusive rights to commercialize *Aimovig* in the rest of the world and gained commercialization rights in Canada. This agreement builds on the previously announced 2015 global collaboration between Novartis and Amgen.

In January 2017, we entered into a collaboration and option agreement with Ionis Pharmaceuticals, Inc. (Ionis) and its affiliate Akcea Therapeutics, Inc. (Akcea) to license two investigational treatments with the potential to significantly reduce cardiovascular risk in patients suffering from high levels of lipoproteins known as Lp(a) and ApoCIII. The two investigational antisense therapies developed by Ionis – called AKCEA-APO(a)-LRx and AKCEA-APOCIII-LRx– have the potential to lower both lipoproteins up to 90% and significantly reduce cardiovascular risk in high-risk patient populations. In addition, Novartis entered into a stock purchase agreement with Ionis and Akcea. This transaction was completed on February 14, 2017.

In December 2016, we entered into a definitive agreement for the acquisition of Encore Vision, Inc., a privately held company focused on the development of UNR844 (formerly EV06), an investigational, first-in-class, potentially disease-modifying topical treatment for presbyopia. This acquisition was completed on January 20, 2017.

In December 2016, we signed an exclusive option, collaboration and license agreement with Conatus Pharmaceuticals Inc. for the global rights to VAY785 (emricasan), an investigational, first-in-class, oral, pan-caspase inhibitor for the treatment of nonalcoholic steatohepatitis with advanced fibrosis and cirrhosis of the liver. Novartis exercised the option on May 3, 2017. Novartis obtained an exclusive, worldwide license to develop and commercialize products containing emricasan on July 5, 2017.

In December 2016, we entered into a definitive agreement for the acquisition of Ziarco Group Limited, a privately held company focused on the development of novel treatments in dermatology, including ZPL389 (adriforant), a once-daily oral H4 receptor antagonist in development for atopic dermatitis. This acquisition was completed on January 20, 2017.

In November 2016, we acquired Reprixys Pharmaceuticals Corporation and SEG101 (crizanlizumab), an anti-P-selectin antibody being investigated in the reduction of vaso-occlusive pain crises in patients with sickle cell disease.

In June 2016, we announced a collaboration and licensing agreement with Xencor for the development of bispecific antibodies for treating cancer. We are collaborating with Xencor to co-develop its bispecific T-cell-engaging antibody targeting CD3xCD123 for the treatment of acute myeloid leukemia. As part of the agreement, Novartis also received the right to develop four additional bispecific antibodies and to use other Xencor proprietary antibody engineering technology for up to 10 additional biotherapeutic programs across the Novartis research and development portfolio. The original terms also included co-development of Xencor's bispecific T-cell-engaging antibody targeting CD3xCD20 for the treatment of B-cell malignancies, which we have since agreed to revert to Xencor.

In January 2016, we announced a collaboration and licensing agreement with Surface Oncology. Novartis obtained an exclusive worldwide license to develop and commercialize an anti-CD73 antibody. As part of the collaboration, Novartis has options to license additional next-generation cancer immunotherapies.

As part of our previously announced exclusive global research and development collaboration with the University of Pennsylvania (Penn) to develop and commercialize targeted chimeric antigen receptor (CAR) immunotherapies for the treatment of cancer, in February 2016 Penn opened the Center for Advanced Cellular Therapeutics (CACT) at the Perelman School of Medicine campus in Philadelphia, Pennsylvania. The CACT is a first-of-its-kind research and development center established specifically to develop and manufacture adoptive T-cell immunotherapies under the

research collaboration guided by scientists and clinicians from NIBR and Penn.

On March 2, 2015, we acquired a right of first negotiation over the co-development or commercialization of GSK's current and future oncology R&D pipeline, excluding oncology vaccines, which expires on September 2, 2027. We acquired this right with the completion of our acquisition of the oncology products of GSK and certain related assets.

Regulation

The international pharmaceutical industry is highly regulated. Regulatory authorities around the world administer numerous laws and regulations regarding the testing, approval, manufacturing, importing, labeling and marketing of drugs, and also review the safety and efficacy of pharmaceutical products. Extensive controls exist on the non-clinical and clinical development of pharmaceutical products. These regulatory requirements, and the implementation of them by local health authorities around the globe, are a major factor in determining whether a substance can be developed into a marketable product, and the amount of time and expense associated with that development.

Health authorities, including those in the US, the EU and Japan, have high standards of technical evaluation. The introduction of new pharmaceutical products generally entails a lengthy approval process. Products must be authorized or registered prior to marketing, and such authorization or registration must subsequently be maintained. In recent years, the registration process has required increased testing and documentation for the approval of new drugs, with a corresponding increase in the expense of product introduction.

To register a pharmaceutical product, a registration dossier containing evidence establishing the safety, efficacy and quality of the product must be submitted to regulatory authorities. Generally, a therapeutic product must be registered in each country in which it will be sold. In every country, the submission of an application to a regulatory authority does not guarantee that approval to market the product will be granted. Although the criteria for the registration of therapeutic drugs are similar in most countries, the formal structure of the necessary registration documents and the specific requirements, including risk tolerance, of the local health authorities can vary significantly from country to country. It is possible that a drug can be registered and marketed in one country while the registration authority in another country may, prior to registration, request additional information from the pharmaceutical company or even reject the product. It is also possible that a drug may be approved for different indications in different countries.

The registration process generally takes between six months and several years, depending on the country, the quality of the data submitted, the efficiency of the registration authority's procedures, and the nature of the product. Many countries provide for accelerated processing of registration applications for innovative products of particular therapeutic interest. In recent years, efforts have been made among the US, the EU and Japan to harmonize registration requirements in order to achieve shorter development and registration times for medical products. However, the requirement in many countries to negotiate selling prices or reimbursement levels with government regulators and other payers can substantially extend the time until a product may finally be available to patients.

The following provides a summary of the regulatory processes in the principal markets served by Innovative Medicines Division affiliates:

United States

In the US, applications for drug registration are submitted to and reviewed by the FDA. The FDA regulates the testing, manufacturing, labeling and approval for marketing of pharmaceutical products intended for commercialization in the US. The FDA continues to monitor the safety of pharmaceutical products after they have been approved for sale in the US market. The pharmaceutical development and registration process is typically intensive, lengthy and rigorous. When a pharmaceutical company has gathered data that it believes sufficiently demonstrates a drug's safety, efficacy and quality, then the company may file a New Drug Application (NDA) or Biologics License Application (BLA), as applicable, for the drug. The NDA or BLA must contain all the scientific information that has been gathered about the drug and typically includes information regarding the clinical experiences of patients tested in the drug's clinical trials. A Supplemental New Drug Application (sNDA) or BLA amendment must be filed for new indications for a previously approved drug.

Once an application is submitted, the FDA assigns reviewers from its staff, including experts in biopharmaceutics, chemistry, clinical microbiology, pharmacology/toxicology, and statistics. After a complete review, these content experts provide written evaluations of the NDA or BLA. These recommendations are consolidated and are used by senior FDA staff in its final evaluation of the NDA or BLA. Based on that final evaluation, the FDA then provides to the NDA or BLA's sponsor an approval, or a "complete response" letter if the NDA or BLA application is not approved. If not approved, the letter will state the specific deficiencies in the NDA or BLA that need to be addressed. The sponsor must then submit an adequate response to the deficiencies in order to restart the review procedure.

Once the FDA has approved an NDA, BLA, sNDA or BLA amendment, the company can make the new drug available for physicians to prescribe. The drug owner must submit periodic reports to the FDA, including any cases of adverse reactions. For some medications, the FDA requires additional post-approval studies (Phase IV) to evaluate long-term effects or to gather information on the use of the product under specified conditions.

Throughout the life cycle of a product, the FDA requires compliance with standards relating to good laboratory, clinical and manufacturing practices. The FDA also requires compliance with rules pertaining to the manner in which we may promote our products.

European Union

In the EU, there are three main procedures for application for authorization to market pharmaceutical products in more than one EU member state at the same time: the centralized procedure, the mutual recognition procedure and the

decentralized procedure. It is also possible to obtain a national authorization for products intended for commercialization in a single EU member state only, or for additional indications for licensed products. The procedure used for first authorization must continue to be followed for subsequent changes, e.g., to add an indication for a licensed product.

Under the centralized procedure, applications are made to the EMA for an authorization that is valid for the European Union (all member states). The centralized procedure is mandatory for all biotechnology products; new chemical entities in cancer, neurodegenerative disorders, diabetes, AIDS, autoimmune diseases and other immune dysfunctions; advanced therapy medicines, such as gene therapy, somatic cell therapy and tissue-engineered medicines; and orphan medicines (medicines for rare diseases). It is optional for other new chemical entities, innovative medicinal products, and medicines for which authorization would be in the interest of public health. When a pharmaceutical company has gathered data that it believes sufficiently demonstrates a drug’s safety, efficacy and quality, the company may submit an application to the EMA. The EMA then receives and validates the application, and the specialized committee for human medicines, the CHMP, appoints

a rapporteur and co-rapporteur to review it. The entire review cycle must be completed within 210 days, although there is a “clock stop” at Day 120 to allow the company to respond to questions set forth in the rapporteur and co-rapporteur’s assessment report. When the company’s complete response is received by the EMA, the clock restarts on Day 121. If there are further aspects of the dossier requiring clarification, the CHMP will issue further questions at Day 180, and may also request an oral explanation, in which case the sponsor must not only response to the further questions but also appear before the committee to justify its responses. On Day 210, the CHMP will take a vote to recommend the approval or non-approval of the application, and their opinion is transferred to the European Commission (EC). The final EC decision under this centralized procedure is a decision that is applicable to all member states. This decision occurs 60 days, on average, after a positive CHMP recommendation.

Under both the mutual recognition procedure (MRP) and the decentralized procedure (DCP), the assessment is led by one member state, called the reference member state (RMS) which then liaises with other member states, known as the concerned member states (CMSs). In the MRP, the company first obtains a marketing authorization in the RMS, which is then recognized by the CMSs in 90 days. In the DCP, the application is done simultaneously in the RMS and all CMSs. During the DCP, the RMS drafts an assessment report within 120 days. Within an additional 90 days, the CMSs review the application and can issue objections or requests for additional information. On Day 90, each CMS must be assured that the product is safe and effective, and that it will cause no risks to the public health. Once an agreement has been reached, each member state grants national marketing authorizations for the product.

After the marketing authorizations have been granted, the company must submit periodic safety reports to the relevant health authority (EMA for the centralized procedure, national health authorities for DCP or MRP). In addition, pharmacovigilance measures must be implemented and monitored, including the collection, evaluation and expedited reporting of adverse events, and updates to risk management plans. For some medications, post-approval studies (Phase IV) may be imposed to complement available data with additional data to evaluate long-term effects (called a Post-Approval Safety Study, or PASS) or to gather additional efficacy data (called a Post-Approval Efficacy Study, or PAES).

European marketing authorizations have an initial duration of five years. The holder of the marketing authorization must actively apply for its renewal after this first five-year period. As part of the renewal procedure, the competent authority will perform a full benefit-risk review of the product. Should the authority conclude that the benefit-risk balance is no longer positive, the marketing authorization can be suspended or revoked. Once renewed, the marketing authorization is valid for an unlimited period. If the holder does not apply for renewal, the marketing authorization automatically lapses. Any marketing authorization that is not followed within three years of its granting by the actual placing on the market of the corresponding medicinal product ceases to be valid.

Japan

In Japan, applications for new products are made through the Pharmaceutical and Medical Devices Agency (PMDA). Once an NDA is submitted, a review team is formed, which consists of specialized officials of the PMDA, including chemistry/manufacturing, non-clinical, clinical and biostatistics. While a team evaluation is carried out, a data reliability survey and Good Clinical Practice/Good Laboratory Practice/Good Manufacturing Practice inspection are carried out by the Office of Conformity Audit and Office of GMP/GQP Inspection of the PMDA. Team evaluation results are passed to the PMDA’s external experts, who then report back to the PMDA. After a further team evaluation, a report is provided to the Ministry of Health, Labor and Welfare (MHLW); the MHLW makes a final determination for approval and refers this to the Council on Drugs and Foods Sanitation, which then advises the MHLW on final approvability. Marketing and distribution approvals require a review to determine whether or not the product in the application is suitable as a drug to be manufactured and distributed by a person who has obtained a manufacturing and distribution business license for the type of drug concerned, and to confirm that the product has been manufactured in a plant compliant with Good Manufacturing Practices.

Once the MHLW has approved the application, the company can make the new drug available for physicians to prescribe. After that, the MHLW lists its National Health Insurance price within 60 days (or 90 days) from the approval, and physicians can obtain reimbursement. For some medications, the MHLW requires additional post-approval studies (Phase IV) to further evaluate safety and/or to gather information on the use of the product under specified conditions. The MHLW also requires the drug’s sponsor to submit periodic safety update reports. Within three months from the specified re-examination period, which is designated at the time of the approval of the application for the new product, the company must submit a re-examination application to enable the drug’s safety and

efficacy to be reassessed against approved labeling by the PMDA.

Price controls

In most of the markets where we operate, the prices of pharmaceutical products are subject to both direct and indirect price controls and to drug reimbursement programs with varying price control mechanisms. Due to increasing political pressure and governmental budget constraints, we expect these mechanisms to continue to remain robust – and to potentially even be strengthened – and to have a negative influence on the prices we are able to charge for our products.

Direct governmental efforts to control prices

United States:

• In the US, President Trump declared the reduction of drug prices as one of his key priorities to be addressed by his administration. In May 2018, the Trump administration unveiled its blueprint of potential actions that could be used to lower drug prices and reduce drug out-of-pocket costs for patients. In the second half of 2018, the Trump administration released a series of

prescription drug-related proposals that may ultimately lead to new price restrictions and cost reduction solutions for pharmaceuticals. A key area of focus is Medicare Part B, which includes prescription drugs dispensed by physicians in their offices or in outpatient clinics. The administration is also considering use of an international pricing comparison model for Medicare Part B drugs that would reduce costs of select medications by aligning US drug reimbursements to prices in other countries.

• In November 2018, the Democratic Party regained majority leadership of the US House of Representatives. Democratic Party leaders have outlined prescription drug costs as one of their priorities in the congressional session that began in January 2019.

• The Independent Payment Advisory Board (IPAB), an entity created under the Patient Protection and Affordable Care Act with authority to implement broad actions to reduce future costs of the Medicare program, was repealed in February 2018.

• Additionally, seven states have passed legislation intended to impact pricing or requiring price transparency reporting (California, Connecticut, Louisiana, Maine, Nevada, Oregon and Vermont). The California law requires 60-day advance notification of price increases for products exceeding a specific threshold over the past two years, as well as additional quarterly reporting requirements. Various formats of drug price reporting and disclosure are required in all seven states. It is expected in 2019 that state legislatures will continue to focus on drug pricing and that similar bills will be passed in more states.

Europe: In Europe, our operations are subject to significant price and marketing regulations. Many governments are introducing healthcare reforms in a further attempt to curb increasing healthcare costs. In the EU, governments influence the price of pharmaceutical products through their control of national healthcare systems that fund a large part of the cost of such products to patients. The downward pressure on healthcare costs in general in the EU, particularly with regard to prescription drugs, has become very intense. Increasingly strict analyses are applied when evaluating the entry of new products, and as a result, access to innovative medicines is limited based on strict cost-benefit assessments. In addition, prices for marketed products are referenced within member states and across member state borders, further impacting individual EU member state pricing. As an additional control for healthcare budgets, some EU countries have passed legislation to impose further mandatory rebates for pharmaceutical products and/or financial claw-backs on the pharmaceutical industry. The calculation of these rebates and claw-backs may lack transparency in some cases and can be difficult to predict.

Japan: In 2018, the National Health Insurance price calculation method for new products and the price revision rule for existing products were reviewed by the Japanese government, and new drug tariffs became effective beginning April 2018. Also in 2018, the MHLW implemented a price maintenance scheme with a narrower scope and decreased number of products. The MHLW also increased the frequency of price cuts from every other year to annually beginning in 2021, and plans to introduce a cost-effectiveness assessment in 2019. The Japanese government is continuing deliberations regarding a healthcare reform initiative with a goal of sustaining universal coverage under the National Health Insurance program, and is addressing the efficient use of drugs, including promotion of use of generic drugs.

Rest of world: Many other countries around the world are also taking steps to control prescription drug prices. For example, China – one of our most important Emerging Growth Markets – organized national price negotiations in 2017 for 36 patented drugs and in 2018 for 17 oncology drugs directly linked to national drug reimbursement, which applied nationwide both in public and military hospitals, as well as a national procurement pilot on certain generic drugs at the end of 2018. These efforts resulted in drug price reductions of more than 50% on average for the drugs subject to these programs. Drug prices in China may further decline due to the national health reform, but meanwhile, reimbursement access is expected to accelerate, which aims to resolve the public issue of accessibility and the high cost of healthcare services. In addition, in 2016, the Colombian government took steps to unilaterally reduce the price of *Glivec* by up to 43% through a local procedural mechanism called a Declaration of Public Interest. While the government's use of this exceptional mechanism as a tool to control the price of a prescription drug and to generally manage its healthcare budget is unprecedented, we continue to contest its appropriateness, as its use could become more widespread if upheld in this case, potentially leading to a more systemic impact on drug pricing. In 2018, Canada proposed amendments to its patented medicines regulations to introduce three new economics-based price regulatory factors and the concept of affordability in price assessments; to update the schedule of comparator countries to include 12 countries with similar consumer protection priorities, economic wealth and marketed medicines as

Canada and to exclude Switzerland and the US; and to require reporting of all confidential discounts and rebates.

Regulations favoring generics and biosimilars

In response to rising healthcare costs, most governments and private medical care providers have instituted reimbursement schemes that favor the substitution of generic pharmaceuticals for more expensive brand-name pharmaceuticals. In the US, generic substitution statutes have been enacted by all states and permit or require the dispensing pharmacist to substitute a less expensive generic drug instead of an original patented drug. Other countries, including numerous European countries, have similar laws. We expect that the pressure for generic substitution will continue to increase. In addition, the US, EU and other jurisdictions are increasingly crafting laws and regulations encouraging the development of biosimilar versions of biologic drugs, which can also be expected to have an impact on pricing.

Cross-border sales

Price controls in one country can also have an impact in other countries as a result of cross-border sales. In the EU, products that we have sold to customers in countries with stringent price controls can be legally resold to customers in other EU countries at a lower price than the price at which the product is otherwise available in the importing country (known as parallel trade). In North America, products that we have sold to customers in Canada – which has relatively stringent price controls – are sometimes resold into the US, again at a lower price than the price at which the product is otherwise sold in the US. Such imports from Canada and other countries into the US are currently illegal. Given the increased focus on pharmaceutical prices in the US, the Trump administration, certain members of the US Congress, and select state legislators continue to explore legislation to allow the safe importation of pharmaceutical products into the US from select countries, including Canada.

We expect that pressures on pricing will continue worldwide and will likely increase. Because of these pressures, there can be no certainty that in every instance we will be able to charge prices for a product that, in a particular country or in the aggregate, would enable us to earn an adequate return on our investment in that product.

Intellectual property

We attach great importance to intellectual property – including patents, trademarks, copyrights, know-how and research data – in order to protect our investment in research and development, manufacturing and marketing. In general, we seek intellectual property protection under applicable laws for significant product developments in major markets. Among other things, patents may cover the products themselves, including the product's active ingredient or ingredients and its formulation. Patents may cover processes for manufacturing a product, including processes for manufacturing intermediate substances used in the manufacture of the product. Patents may also cover particular uses of a product, such as its use to treat a particular disease, or its dosage regimen. In addition, patents may cover assays or tests for certain diseases or biomarkers – which can improve patient outcomes when administered with certain drugs – as well as assays, research tools and other techniques used to identify new drugs. The protection offered by such patents extends for varying periods, depending on the grant and duration of patents in the various jurisdictions. The protection afforded, which may vary from country to country, depends upon the type of patent and its scope of coverage.

In addition to patent protection, various countries offer data or marketing exclusivities for a prescribed period of time. Data exclusivity may be available that would preclude a potential competitor from filing a regulatory application for a set period of time that relies on the sponsor's clinical trial data, or the regulatory authority from approving the application. The data exclusivity period can vary depending upon the type of data included in the sponsor's application. When it is available, market exclusivity, unlike data exclusivity, precludes a competitor from obtaining marketing approval for a product even if a competitor's application relies on its own data. Data exclusivity and other regulatory exclusivity periods generally run from the date a product is approved, and so their expiration dates cannot be known with certainty until the product approval date is known.

In the US and other countries, pharmaceutical products are eligible for a patent term extension for patent periods lost during product development and regulatory review. The law recognizes that product development and review by the FDA and other health authorities can take an extended period, and permits an extension of the patent term for a period related to the time taken for the conduct of clinical trials and for the health authority's review. However, the length of this extension and the patents to which it applies cannot be known in advance and can only be determined after the product is approved.

United States

Patents

In the US, a patent issued for an application filed today will receive a term of 20 years from the earliest application filing date, subject to potential patent term adjustments for delays in patent issuance based upon certain delays in prosecution by the United States Patent and Trademark Office (USPTO). A US pharmaceutical patent that claims a product, method of treatment using a product, or method of manufacturing a product may also be eligible for a patent term extension based on the time the FDA took to approve the product. This type of extension may only extend the patent term for a maximum of five years, and may not extend the patent term beyond 14 years from regulatory approval. Only one patent may be extended for any product based on FDA delay.

In practice, however, it is not uncommon for significantly more than the five-year maximum patent extension period to pass between the time that a patent application is filed for a product and the time that the product is approved by the

FDA. As a result, it is rarely the case that, at the time a product is approved by the FDA, it will have the full 20 years of remaining patent life. Rather, in our experience, it is not uncommon that, at the date of approval, a product will have from 13 to 16 years of patent protection remaining, including all extensions available at that time.

Data and market exclusivity

In addition to patent exclusivities, the FDA may provide data or market exclusivity for a new chemical entity or an "orphan drug," each of which runs in parallel to any patent protection. Regulatory data protection or exclusivity prevents a potential generic competitor from relying on clinical trial data generated by the sponsor when establishing the safety and efficacy of its competing product. Market exclusivity prohibits any marketing of the same drug for the same indication.

• A new small-molecule active pharmaceutical ingredient shall have five years of regulatory data exclusivity, during which time a competitor generally may not submit an application to the FDA based on a sponsor's clinical data.

• Orphan drug exclusivity provides seven years of market exclusivity for drugs designated by the FDA as “orphan drugs,” meaning drugs that treat rare diseases, as designated by the FDA. During this period, a potential competitor may not market the same drug for the same indication even if the competitor’s application does not rely on data from the sponsor.
• A new biologic active pharmaceutical ingredient shall have 12 years of market exclusivity, during which time a competitor may not market the same drug for the same indication.
• The FDA may also request that a sponsor conduct pediatric studies, and in exchange, it will grant an additional six-month period of pediatric market exclusivity if the FDA accepts the data, the sponsor makes a timely application for approval for pediatric treatment, and the sponsor has either a patent-based or regulatory-based exclusivity period for the product that can be extended.

European community

Patents

Patent applications in Europe may be filed in the European Patent Office (EPO) or in a particular country in Europe. The EPO system permits a single application to be granted for the EU plus other non-EU countries such as Switzerland and Turkey. When the EPO grants a patent, it is then validated in the countries that the patent owner designates. The term of a patent granted by the EPO or a European country office is generally 20 years from the filing date of the patent application on which the patent is based, subject to potential patent term extensions. Pharmaceutical patents can be granted a further period of exclusivity under the Supplementary Protection Certificate (SPC) system. SPCs are designed to compensate the owner of the patent for the time it took to receive marketing authorization of a product by the European health authorities. An SPC may be granted to provide, in combination with the patent, up to 15 years of exclusivity from the date of the first European marketing authorization. However, an SPC cannot last longer than five years. The SPC duration can additionally be extended by a further Pediatric Extension of six months if the product is the subject of an agreed pediatric investigation plan. The post-grant phase of patents, including the SPC system, is currently administered on a country-by-country basis under national laws that, while differing, are intended to (but do not always) have the same effect.

In practice, as in the US, it is not uncommon for patent term extensions to not fully compensate the owner of a patent for the time it took to develop the product and receive marketing authorization by the European health authorities. Accordingly, it is not uncommon that a pharmaceutical product, at the date of approval, will have patent protection for 10 to 15 years, including extensions available at that time.

Data and market exclusivity

In addition to patent exclusivity, the EU provides a system of regulatory data exclusivity for authorized human medicines, which runs in parallel to any patent protection. The system for drugs being approved today is usually referred to as “8+2+1” because it provides: an initial period of eight years of data exclusivity, during which a competitor cannot rely on the relevant data; a further period of two years of market exclusivity, during which the data can be used to support applications for marketing authorization but the competitive product cannot be launched; and a possible one-year extension of the market exclusivity period if, during the initial eight-year data exclusivity period, the sponsor registered a new therapeutic indication with “significant clinical benefit.” This system applies both to national and centralized authorizations. It has been in force since 2005; therefore, some medicines remain covered by the previous system in which EU member states provided either six or 10 years of data exclusivity.

The EU also has an orphan drug exclusivity system for medicines similar to the US system. If a medicine is designated as an “orphan drug,” then it benefits from 10 years of market exclusivity after it is authorized, during which time a similar medicine for the same indication will not receive marketing authorization. Under certain circumstances, this exclusivity can be extended with a two-year Pediatric Extension.

Japan

Patents

In Japan, a patent can be issued for active pharmaceutical ingredients. Although methods of treatment – such as dosage and administration – are not patentable in Japan, pharmaceutical compositions for a specific dosage or administration method are patentable. Processes to make a pharmaceutical composition are also patentable. The patent term granted is generally 20 years from the filing date of the patent application on which the patent is based, subject to potential patent term extensions and adjustments. A patent term extension can be granted for up to five years under the Japanese Patent Act to compensate for erosion against the patent term caused by the time needed to obtain marketing

authorization from the MHLW. As in the US and EU, patent term extensions in Japan may not fully compensate for the time necessary to develop a product and obtain a marketing authorization. As a result, it is not uncommon for the effective term of patent protection for an active pharmaceutical ingredient in Japan to be approximately 10 to 15 years, including available extensions.

Data and market exclusivity

Japan also has a regulatory data protection system called a “re-examination period” of eight years for new chemical entities and of four to six years for new indications and formulations, and a 10-year orphan drug exclusivity system.

Third-party patents and challenges to intellectual property

Third parties can challenge our patents, patent term extensions and marketing exclusivities, including pediatric extensions and orphan drug exclusivity, through various proceedings. For example, patents in the US can be challenged in the USPTO through various proceedings, including Inter Partes Review (IPR) proceedings. They

may also be challenged through patent infringement litigation under the Abbreviated New Drug Application (ANDA) provisions of the Hatch-Waxman Act, or the Biologics Price Competition and Innovation Act (BPCIA). See generally "—Sandoz—Intellectual property." In the EU, EU patents may be challenged through oppositions in the EPO, or national patents may be challenged in national courts or national patent offices. In Japan, patents may be challenged in the Japanese patent office and in national courts. The outcomes of such challenges can be difficult to predict.

In addition to directly challenging our intellectual property rights, in some circumstances a competitor may be able to market a generic version of one of our products by, for example, designing around our intellectual property or marketing the generic product for non-protected indications. Despite data exclusivity protections, a competitor could opt to incur the costs of conducting its own clinical trials and preparing its own regulatory application, and avoid our data exclusivity protection altogether. There is a risk that some countries may seek to impose limitations on the availability of intellectual property right protections for pharmaceutical products, or on the extent to which such protections may be enforced. For example, a review of several intellectual property rights is currently ongoing in the EU (orphan drug exclusivity, pediatric extensions, SPCs and regulatory data protection), which could lead to legislative changes in the scope and/or term of protection under those rights. Also, even though we may own, co-own or in-license patents protecting our products, and conduct pre-launch freedom-to-operate analyses, a third party may nevertheless claim that one of our products infringes a third-party patent for which we do not have a license.

As a result, there can be no assurance that our intellectual property will protect our products or that we will be able to avoid adverse effects from the loss of intellectual property protection or from third-party patents in the future.

Intellectual property protection for certain key marketed products and compounds in development

We present below certain additional details regarding intellectual property protection for certain Innovative Medicines Division products and compounds in development. For each product and compound in development below, we identify issued, unexpired patents by general subject matter and, in parentheses, years of expiry in, if relevant, the US, EU and Japan that are owned, co-owned or exclusively in-licensed by Novartis and that relate to the product or to the method of its use as it is currently approved and marketed or, in the case of a compound in development, as it is currently filed with the FDA and/or the EMA for approval. Identification of an EU patent refers to national patents in EU countries and/or to the national patents that have been derived from a patent granted by the EPO. Novartis may own or control additional patents relating to, for example, compound forms, methods of use, formulations, processes, synthesis, purification and detection.

We identify unexpired regulatory data protection periods and, in parentheses, years of expiry if the relevant marketing authorizations have been authorized or granted. The term "RDP" refers to regulatory data protection, regulatory data exclusivity (which in the EU refers to the protections under "8+2+1" regulatory data exclusivity), and data re-examination protection systems. We identify certain unexpired patent term extensions and marketing exclusivities and, in parentheses, years of expiry if they are granted; their subject matter scope may be limited and is not specified. Marketing exclusivities and patent term extensions include orphan drug exclusivity (ODE), pediatric exclusivity (PE), patent term extensions (PTE) and SPCs. We designate them as "pending" if they have been applied for but not granted and years of expiry are estimable. Such pending applications may or may not ultimately be granted.

In the case of the EU, identification of a patent, patent term extension, marketing exclusivity or data protection means grant, authorization and maintenance in at least one country and possibly pending or found invalid in others.

For each product below, we indicate whether there is current generic competition – which in the case of products containing biologics, refers to biosimilar competition – for one or more product versions in one or more approved indications in each of the major markets for which intellectual property is disclosed. We identify ongoing challenges to the disclosed intellectual property that have not been finally resolved, including IPRs if instituted by the USPTO. Challenges identified as being in administrative entities, such as national patent offices, include judicial appeals from decisions of those entities. Resolution of challenges to the disclosed intellectual property, which in the EU may involve intellectual property of one or more EU countries, may include settlement agreements under which Novartis permits or does not permit future launch of generic versions of our products before expiration of that intellectual property. We identify certain material terms of such settlement agreements where they could have a material adverse effect on our business. In other cases, such settlement agreements may contain confidentiality obligations restricting what may be disclosed.

For additional information regarding commercial arrangements with respect to these products, see "—Key marketed products."

Novartis Oncology business unit
Oncology
• *Tasigna.* US: Patent on compound (2023), PE (2024); patents on salt forms (2026, 2027, 2028), three PEs (2027, 2028, 2029); patent on polymorph compound form (2026), PE (2027); patents on capsule form (2026, 2027), two PEs (2027, 2028) and patent on method of treatment (2032), PE (2032). EU: Patent on compound (2023); patent on salt form (2026); patent on polymorph compound form (2026); patent on capsule form (2027); patent on method of treatment (2030); ODE (2017), PE (2019). Japan: Patent on compound (2023), PTE (2024); patent on salt form (2026); patent on polymorph compound form (2026); patent on capsule form (2027); patent on method of treatment (2030).
There is currently no generic competition in the US, EU or Japan. In the US, the salt form patents, the polymorph patent, the capsule form patent and the method
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of treatment patent are being challenged in ANDA proceedings against generic manufacturers. The EU method of treatment patent, the capsule form patent, and the polymorph compound patent are being opposed in the EPO.

• *Sandostatin* SC and *Sandostatin* LAR.

Sandostatin SC. There is no patent protection in the US, EU or Japan. There is generic competition in the US, EU and Japan.

Sandostatin LAR. There is no patent protection in the US, EU or Japan. There is currently no generic competition in the US, EU or Japan.

• *Gleevec/Glivec.* US: Patent on polymorphic compound form (2019), PE (2019); patent on GIST method of use (2021), PE (2022). EU: Patent on GIST method of use (2021); patent on tablet formulation (2023). Japan: Patent on polymorphic compound form (2019); patent on GIST method of use (2021); patent on tablet formulation (2023). There is generic competition in the US, EU and Japan. In the US and EU, Novartis has resolved patent litigation with certain generic manufacturers. Novartis is taking steps in some EU countries to enforce the tablet formulation patent and the GIST method of use patent. The EU GIST method of use patent is being challenged in one EU country. The EU tablet formulation patent is being challenged in the EPO and in the patent office of one EU country.

• *Afinitor/Votubia* and *Afinitor Disperz/Votubia* dispersible tablets. US: Patent on compound (2014), PTE (2019), PE (2020); patent on dispersible tablet formulation (2022), PE (2023); patent on antioxidant (2019); patent on antioxidant (2019), PE (2020); patent on tuberous sclerosis complex (TSC)/subependymal giant cell astrocytoma (SEGA) use (2022), PE (2022); patent on breast cancer use (2022), PE (2022); patent on renal cell carcinoma use (2025), PE (2026); patent on pancreatic neuroendocrine tumor use (2028); RDP for neuroendocrine tumors of gastrointestinal or lung origin (2019), PE (2019); ODE for TSC/renal angiomyolipoma (2019), PE (2019). EU: Patent on dispersible tablet formulation (2022); patent on antioxidant (2019); patent on breast cancer use (2022); patent on renal cell carcinoma use (2022); patent on TSC/SEGA use (2022); patent on use in neuroendocrine tumors of lung origin (2022); ODE (*Votubia*) (2021). Japan: Patent on dispersible tablet formulation (2022); patent on antioxidant (2019); patent on breast cancer use (2022); patent on pancreatic neuroendocrine tumor use (2026); patent on renal cell carcinoma use (2022); patent on gastrointestinal and lung neuroendocrine tumor use (2026), PTE (2027); patent on TSC/SEGA and TSC/AML use (2027); ODE (tuberous sclerosis) (2022); ODE (dispersible tablet) (2022).

There is currently no generic competition in the US, EU or Japan. In the US, the compound patent and renal cell carcinoma use patent are being challenged in ANDA proceedings against generic manufacturers. The US renal cell carcinoma use and pancreatic neuroendocrine tumor use patents are being challenged in IPR proceedings in the USPTO. In the US, Novartis has resolved patent litigation with certain generic manufacturers which may result in limited generic competition for *Afinitor* toward the end of 2019, and has resolved patent litigation relating to *Afinitor Disperz*. The EU breast cancer use patent, the EU TSC/SEGA use patent and the EU renal cell carcinoma use patent are being opposed in the EPO. The Japanese breast cancer use patent is being challenged in the Japanese Patent Office.

• *Promacta/Revolade.* US: Patent on compound (2021), PTE (2022), PE (2023); patent on compound (2018), PE (2019); two patents on compound (2021, 2021), PEs (2021, 2021); patent on method of treating thrombocytopenia (2021), PE (2021); patent on method of enhancing platelet production (2021), PE (2021); patent on method of enhancing platelet production (2023), PE (2023); patent on salt form (2025); PE (2026); four patents on formulation of different dose strengths (2027) (4), PE (2028) (4); ODE (2021), two PEs (2022, 2022). EU: Patents on compound (2021); patent on compound (2021), SPC (2025); patent on salt form (2023); patent on formulation (2027); RDP (2020). Japan: Patent on compound (2021), PTE (2025); patent on salt form (2023); PTE (2023), patent on formulation (2027); RDP (2020). There is currently no generic competition in the US, EU or Japan. In the US, generic manufacturers have filed ANDAs challenging certain patents other than the compound patents. The EU formulation patent is being opposed in the EPO.

• *Tafinlar* and *Mekinist.*

Tafinlar. US: Two patents on compound (2030; 2030); patent on method of use (2029); RDP (2018); ODE (2020). EU: Patent on compound (2029); RDP (2023). Japan: Patent on compound (2031). There is currently no generic competition in the US, EU or Japan.

Mekinist. US: Patent on compound (2025), PTE (2027); patent on method of use (2025); three patents on formulation (2032) (3); RDP (2018); ODE (2020). EU: Patent on compound (2025), SPC (2029); RDP (2025). Japan: Patent on compound (2025); patent on method of use (2025); patent on formulation (2031). There is currently no generic

competition in the US, EU or Japan.

Use of *Mekinist* with *Tafinlar* or *Tafinlar* with *Mekinist*. US: Patent on combination (2030); patent on method of use of combination (2030); RDP (2020); ODE on melanoma with certain mutations (2021), ODE on non-small cell lung cancer (2024). EU: RDP (2025). Japan: Patent on method of use of combination (2030). There is currently no generic competition in the US, EU or Japan.

• *Exjade* and *Jadenu.*

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Exjade. US: Patent on compound (2017), PTE (2019), ODE for non-transfusion iron overload (2020). EU: Patent on compound (2017), SPC (2021), PE (2022); patent on dispersible tablet formulation (2023). Japan: Patent on compound (2017), PTE (2021); patent on dispersible tablet formulation (2023). There is currently no generic competition in the US, EU or Japan. In the US, Novartis has resolved patent litigation with generic manufacturers relating to *Exjade*.

Jadenu (marketed as *Exjade* FCT in EU and Japan). The compound patents for *Exjade* also protect *Jadenu* (US), and *Exjade* FCT (EU/Japan). US: Patent on film-coated tablet formulation (2034), ODE for non-transfusion iron overload (2020). EU: Patent on film-coated tablet formulation (2034). There is currently no generic competition in the US, EU or Japan. In the US, the formulation patent is being challenged in ANDA proceedings against a generic manufacturer. Novartis has resolved patent litigation relating to the US formulation patent with a generic manufacturer. In the EU, the formulation patent is being opposed in the EPO.

• *Jakavi.* EU: Patent on compound (2026), SPC (2027); patent on salt (2028); RDP (2023). Japan: Patent on compound (2026), PTE (2028), PTE (2030); patent on salt (2028), PTE (2028), PTE (2030); patent on method of use (2026), PTE (2027); RDP (2022). There is currently no generic competition in the EU or Japan. The EU salt patent is being opposed in the EPO.

• *Votrient.* US: Patent on compound (2021), PTE (2023), two patents on compound (2021, 2021), ODE (2019). EU: Patent on compound (2021), SPC (2025); RDP (2021). Japan: patent on compound (2021), two PTEs (2025, 2026); RDP (2020). There is currently no generic competition in the US, EU or Japan.

• *Kisqali*. US: Three patents on compound (2028, 2030, 2031), pending PTE (2031); three patents on methods of use (2029, 2029, 2031); patent on salt (2031); RDP (2022). EU: Patent on compound (2027); patent on compound (2029), SPC (2032); patent on methods of use (2029); RDP (2027). Japan: Two patents on compound (2027, 2029). *Kisqali* is currently not marketed in Japan. There is currently no generic competition in the US or EU.

• *Kymriah*. US: Seven patents on cells and/or pharmaceutical compositions comprising the cells (2031) (7); four patents on methods of use (2031) (4); RDP (2029), PE (2030); ODE for r/r pedALL (2024); ODE for r/r DLBCL (2025), PE (2025). EU: Two patents on methods of use (2031, 2031); RDP (2028); ODE (2028), PE (2030). Japan: One patent on pharmaceutical compositions (2031); one patent on cells, pharmaceutical compositions and medical uses (2031). *Kymriah* is currently not marketed in Japan. There is currently no generic competition in the US or Europe.

• *Lutathera*. US: RDP (2023), ODE (2025); EU: RDP (2027), ODE (2027). *Lutathera* is currently not marketed in Japan. There is currently no generic competition in the US or EU.

Novartis Pharmaceuticals business unit

Ophthalmology

• *Lucentis.* EU: Patent on compound (2018), SPC (2022). Japan: Patent on compound (2018), PTE for age-related macular degeneration (2019), PTE for pathologic myopia (2021), PTE for retinal vein occlusion (2023). There is currently no generic competition in the EU or Japan.

• *Duotrav, Travatan* and *Travatan Z.*

Duotrav. EU: Six patents on formulations (2029) (6). Japan: Two patents on formulations (2029, 2029). *Duotrav* is not marketed in the US. There is generic competition in some EU countries. There is currently no generic competition in Japan. In the EU, the six formulation patents are being opposed in the EPO.

Travatan. EU: Six patents on formulations (2029) (6). *Travatan* is not marketed in the US or Japan. There is generic competition in the EU. In the EU, the six formulation patents are being opposed in the EPO.

Travatan Z. US: Three patents on formulations (2027, 2027, 2029). Japan: Three patents on formulation (2027) (3). *Travatan Z* is not marketed in the EU. There is currently no generic competition in the US. There is generic competition in Japan. In the US, Novartis has resolved patent litigation with certain generic manufacturers.

• *Luxturna*. EU: ODE (2028).

Immunology, Hepatology and Dermatology

• *Cosentyx.* US: Patent on compound (2026), PTE (2029); patent on method of use (psoriasis) (2032); patent on method of use (ankylosing spondylitis) (2033); RDP (2027). EU: Patent on compound (2025), SPC (2030); patent on method of use (psoriasis) (2031); RDP (2026). Japan: Patent on compound (2025), PTE (2026, 2028, 2029); patent on method of use (psoriasis) (2031), PTE (2032, 2033); patent on method of use (psoriatic arthritis) (2031); RDP (2022). There is currently no generic competition in the US, EU or Japan.

• *Xolair.* US: Two patents on syringe formulation (2021, 2024). EU: Two patents on syringe formulation (2021, 2024). Japan: Two patents on syringe formulation (2021, 2024). There is currently no generic competition in the US, EU or Japan.
• *Ilaris.* US: Patent on compound (2024); patent on method of use in cryopyrin-associated periodic syndromes (CAPS) (2026), patent on method of use in familial Mediterranean fever (FMF) (2026), patent on method of use in systemic onset juvenile idiopathic arthritis (SJIA) (2027), patent on method of use in hyperimmunoglobulin D syndrome (HIDS) and tumor necrosis factor receptor-associated periodic syndrome (TRAPS) (2028); patent on formulation (2029); RDP (2021). EU: Patent on compound (2021), SPC (2024), PE (2025); patent on method of use in SJIA (2026), patent on method of use in FMF (2026), patent

on formulation (2029); RDP (2020). Japan: Patent on compound (2021), PTE for CAPS (2024), PTE for FMF, HIDS and TRAPS (2026); patent on method of use in familial cold urticaria, neonatal onset multisystem inflammatory disease, SJIA and FMF (2026), patent on method of use in Muckle Wells syndrome (2026), patent on formulation (2029); ODE for CAPS (2021); ODE for FMF, HIDS and TRAPS (2026); ODE for SJIA (2028). There is currently no generic competition in the US, EU or Japan.

Neuroscience

• *Gilenya.* US: Patent on compound (2014), PTE (2019), PE (2019); patent on dosage regimen (2027). EU: RDP (2022); patent on formulation (2024), SPC (2026). Japan: RDP (2021); two patents on formulation (2024, 2024). There is currently no generic competition in the US, EU or Japan. In the US, the compound patent is being challenged in ANDA proceedings against generic manufacturers. The US dosage regimen patent is being challenged in an IPR proceeding in the USPTO. Novartis is taking steps to enforce the US dosage regimen patent against generic manufacturers.

• *Aimovig* (formerly AMG 334). US (co-commercialized with Amgen): Patent on compound (2031), RDP (2030). EU: Patent on compound (2029), RDP (2028). There is currently no generic competition in the US or EU.

Respiratory

• *Xolair.* The information set forth in the IP paragraph for *Xolair* under the "Immunology, Hepatology and Dermatology" heading also applies to *Xolair* for respiratory indications. There is currently no generic competition in the US, EU or Japan.

Cardio-Metabolic

• *Entresto.* US: Four patents on combination (2023) (4); two patents on complex (2026; 2027); RDP (2020). EU: Patent on combination (2023), SPC (2028); patent on complex (2026), SPC (2030); RDP (2025). Japan: Patent on combination (2023); patent on complex (2026); patent on formulation (2028). There is currently no generic competition in the US, EU or Japan. The EU complex patent is being opposed in the EPO.

Established Medicines

• *Galvus* and *Eucreas*. EU: Patent on compound (2019), SPC (2022); patent on combination (2021), SPC (2022); patent on *Galvus* formulation (2025); patent on *Eucreas* formulation (2026). Japan: Patent on compound (2019), PTE on mono therapy and combinations with sulfonyureas (2024), PTE on combinations with other antidiabetics (2022), PTE on *Eucreas* combination (2024); patent on combination (2021); patent on *Galvus* formulation (2025), PTE (2025); patent on *Eucreas* formulation (2026), PTE (2028); *Eucreas* RDP (2019). *Galvus/Eucreas* is not marketed in the US. There is generic competition for *Galvus* and *Eucreas* in some EU countries. There is currently no generic competition in Japan. The EU *Eucreas* formulation patent is being opposed in the EPO.

• *Diovan* and *Co-Diovan/Diovan HCT. Diovan*: There is generic competition in the US, EU and Japan.
Co-Diovan/Diovan HCT: There is generic competition in the US, EU and Japan.

• *Exforge* and *Exforge HCT.*
Exforge. US: Patent on *Exforge* combination (2019). EU: Patent on *Exforge* combination/*Exforge HCT* combination (2019), SPC (2021). There is generic competition in the US, EU and Japan. The EU *Exforge* combination/*Exforge HCT* combination patent is being challenged in the EPO and in the patent offices and courts of some EU countries. In the EU, Novartis has resolved patent litigation with certain generic manufacturers. Novartis is taking steps to enforce the EU *Exforge* combination/*Exforge HCT* combination patent against generic manufacturers.
Exforge HCT. US: Patent on *Exforge HCT* combination (2023); patent on formulation (2023). EU: patent on *Exforge* combination/*Exforge HCT* combination (2019), SPC (2021); RDP (2019). Japan: Patent on *Exforge HCT* combination (2023). There is generic competition in the US. There is currently no generic competition in the EU. *Exforge HCT* is not currently marketed in Japan. The EU *Exforge* combination/*Exforge HCT* combination patent is being challenged in the EPO and in the patent offices and courts of some EU countries. In the EU, Novartis has resolved patent litigation with certain generic manufacturers.

• *Zortress/Certican*. US: Patent on compound (2014), PTE (2019), PE (2020); patent on dispersible tablet formulation (2022), PE (2023); patent on antioxidant (2019); patent on antioxidant (2019), PE (2020); EU: Patent on dispersible tablet formulation (2022); patent on antioxidant (2019). Japan: Patent on dispersible tablet formulation (2022); patent on antioxidant (2019). There is currently no generic competition in the US, EU or Japan. In the US, the compound patent is being challenged in ANDA proceedings against generic manufacturers.

• *Neoral.* There is no patent protection for *Neoral* in the US, EU or Japan. There is generic competition in the US, EU and Japan.

Compounds in development

We provide the following information for non-marketed compounds in development that have been filed with the FDA and/or the EMA for registration but have not yet been approved by either agency for any indication.

• AVXS-101 (onasemnogene abeparvovec-xxxx, *Zolgensma*). US: Patent on vector (2026). EU: Two patents on vector (2024, 2028); patent on method of treatment (2028). Japan: Patent on vector (2024); two patents on method of treatment (2028, 2028).

• BAF312 (siponimod, *Mayzent*). US: Patent on compound (2024); patent on dosage regimen (2030). EU: Patent on compound (2024); patent on solid form (2029); patent on dosage regimen (2029). Japan: Patent on compound (2024); patent on solid form (2029); patent on dosage regimen (2029); two patents on formulation (2032).
• BYL719 (alpelisib). US: Patent on compound (2029); patent on compound and method of treatment (2030). EU: Patent on compound and method of treatment (2029). Japan: Patent on compound and method of treatment (2029).
• LCI699 (osilodrostat). US: Patent on compound (2028), patent on method of treatment (2031), patent on tablet form (2035). EU: Patent on compound (2026), patent on method of treatment (2031); patent on polymorph compound form (2033); patent on tablet form (2035). Japan: Patent on compound (2026), patent on method of treatment (2031); patent on polymorph compound form (2033).

Sandoz

Our Sandoz Division is a global leader in generic pharmaceuticals and biosimilars and sells products in well over 100 countries. In 2018, the Sandoz Division achieved consolidated net sales of USD 9.9 billion, representing 19% of the Group's total net sales. Sandoz develops, manufactures and markets finished dosage form medicines as well as intermediary products including active pharmaceutical ingredients.
Sandoz is organized globally into three franchises: Retail Generics, Anti-Infectives and Biopharmaceuticals. In Retail Generics, Sandoz develops, manufactures and markets active ingredients and finished dosage forms of pharmaceuticals to third parties. Retail Generics includes the areas of cardiovascular, central nervous system, dermatology, gastrointestinal and hormonal therapies, metabolism, oncology, ophthalmics, pain and respiratory, as well as finished dosage form anti-infectives sold to third parties. In Anti-Infectives, Sandoz manufactures and supplies active pharmaceutical ingredients and intermediates – mainly antibiotics – for internal use by Retail Generics and for sale to third-party customers. In Biopharmaceuticals, Sandoz develops, manufactures and markets protein- or other biotechnology-based products, including biosimilars, and provides biotechnology manufacturing services to other companies.
The Sandoz strategic goal is to be a leader in off-patent medicines, driving sustainable and profitable growth. The divisional strategy focuses simultaneously on two pillars: leading the development of an emerging segment of the healthcare market between innovation-driven originator medicines and cost-driven commodity generic medicines, such as biosimilars, complex generics, value-added medicines and digital therapeutics, and excellence in the development, manufacturing and marketing of medicines in selected parts of the standard generics segment.
Sandoz executes on its divisional strategy by focusing on several key priorities, including investing in key markets and therapeutic areas where it is best positioned to make a real difference, increasing the performance of its small-molecule Development and Regulatory organization, and maximizing opportunities in biosimilars. Sandoz also focuses on products that can add more value for patients, payers and healthcare professionals than standard generics, including seeking opportunities to leverage digital therapeutics.
In 2018, in a key strategic step to evolve the Sandoz portfolio toward more differentiated products, Novartis announced an agreement to sell selected portions of its Sandoz US portfolio, specifically the Sandoz US dermatology business and generic US oral solids portfolio, to Aurobindo Pharma USA Inc., for USD 0.9 billion in cash plus USD 0.1 billion in potential earn-outs. The Sandoz US portfolio to be sold to Aurobindo includes approximately 300 products, as well as additional development projects. The sale includes the Sandoz US generic and branded dermatology businesses as well as its dermatology development center. As part of the transaction, Aurobindo agreed to acquire the manufacturing facilities in Wilson, North Carolina, as well as Hicksville, New York, and Melville, New York. These businesses had net sales of approximately USD 1.2 billion in 2018. The transaction is expected to close in the course of 2019 following the satisfaction of customary closing conditions.
Sandoz has a strong and continued strategic focus on biosimilars, which it began developing in 1996 and today sells in more than 80 countries. Sandoz is a market leader in biosimilars, with a total of eight approved and marketed products. Availability of our biosimilars varies by country.
We launched *Hyrimoz* (biosimilar adalimumab) in the EU in October 2018, and *Zessly* (biosimilar infliximab) in the EU in November 2018. *Hyrimoz* was also approved in the US in October 2018. However, under the terms of our settlement with AbbVie, we are not entitled to launch *Hyrimoz* in the US until October 2023. Please see "—Item 4.B Business overview—Sandoz—Intellectual property" below for additional information.

The FDA approved biosimilar *Erelzi* (etanercept-szzs) in 2016 to treat multiple inflammatory diseases. The launch of this biosimilar in the US is pending litigation with Amgen, which markets Enbrel®.

Our biosimilar pegfilgrastim was approved and launched in the EU as *Ziextenzo* in November 2018, and we plan to submit additional data for biosimilar pegfilgrastim to the FDA in 2019 to address a complete response letter (CRL) received from the FDA in June 2016.

We received a CRL from the FDA in May 2018 for our biosimilar rituximab, and subsequently announced in November 2018 that we do not plan to pursue our submission for biosimilar rituximab in the US at this time.

Separately, we received a CRL from the FDA in 2018 for our submission for a generic form of fluticasone propionate and salmeterol inhalation powder, for oral inhalation (GSK's Advair®).

According to IQVIA (formerly IMS Health), as of November 2018, Sandoz holds a leading global position in sales of biosimilars and of generic anti-infectives and oncology medicines. In addition, Sandoz holds leading global positions in key therapeutic areas, including generic cardiovascular, central nervous system, gastrointestinal, metabolism, pain and respiratory medicines.

In 2018 and January 2019, key Retail Generics product launches in the US included *Glatopa* 40 mg/mL (generic Copaxone® 40 mg/mL), palonesetron hydrochloride injection (generic Aloxi®), generic bupropion XL, and *SYMJEPI* (epinephrine) 0.15 mg injection (pediatric formulation), as well as innovative digital therapeutics *reSET* and *reSET-O* (together with Pear Therapeutics).

In 2018, Retail Generics product launches in various European countries included generic versions of rosuvastatin film-coated tablets, ezetimide and simvastatin film-coated tablets, and ezetimide film-coated tablets, as well as buprenorphine and naloxone sublingual tablets.

Following an internal reorganization announced on January 27, 2016, 19 mature products were transferred from our Innovative Medicines Division to the Retail Generics franchise of Sandoz.

Sandoz also holds operational responsibility for the Novartis Social Business unit. Novartis Social Business aims to help improve public health in lower-income countries by developing novel, sustainable business models that enable access to high-quality medicines against infectious and chronic diseases while also strengthening healthcare capacity. Everything Novartis Social Business does is rooted in the local communities it serves and relies on its network of partners who share the same purpose. The unit comprises several legacy programs (Novartis Access, the Novartis Malaria Initiative, and Novartis Healthy Family) supported by digital enabling platforms, and has full responsibility for the entire Novartis product range for seven countries in Asia and Africa. For additional information, see "—Item 4.B Business overview—Overview—Corporate responsibility."

New products

Sandoz launched a number of products in various countries in 2018 and January 2019, including:

- *reSET* (FDA-authorized prescription digital therapeutic for the treatment of patients with substance use disorder in the US)
- *reSET-O* (FDA-cleared prescription digital therapeutic for the treatment of patients with opioid use disorder in the US)
- *Ziextenzo* (biosimilar pegfilgrastim), approved in Europe in 2018 to reduce the duration of neutropenia and incidence of febrile neutropenia in adult patients treated with cytotoxic chemotherapy for malignancy with the exception of chronic myeloid leukemia and myelodysplastic syndromes
- *Hyrimoz* (biosimilar adalimumab), approved in Europe in 2018 to treat multiple inflammatory diseases
- *Zessly* (biosimilar infliximab), approved in Europe in 2018 to treat multiple immunological diseases
- *Glatopa* 40 mg/mL (generic Copaxone® 40 mg/mL)
- Palonesetron hydrochloride injection
- Bupropion XL
- Rosuvastatin film-coated tablets
- Ezetimide and simvastatin film-coated tablets
- Ezetimide film-coated tablets
- Buprenorphine and naxolone sublingual tablets

Key marketed products

Sandoz markets approximately 1 000 molecules in countries around the world. The following are some of the Sandoz key marketed products in each of its franchises (availability varies by market):

Retail Generics

Product	Originator drug	Description
Amoxicillin/clavulanic acid	Augmentin®	Antibiotic
Cyclophosphamide	Endoxan®	Breast, ovarian and non-small cell cancer treatment
Leuprorelin	Various	Hormonal treatment
Levothyroxine sodium	Synthroid®; Levoxyl®	Hypothyroidism treatment
Potassium	Klor-Con®	Hypokalemia treatment

Zoledronic acid 64	Aclasta	Osteoporosis treatment

Anti-Infectives

Active ingredients	Description
Oral and sterile penicillins	Anti-infectives
Oral and sterile cephalosporins	Anti-infectives
Clavulanic acid and mixtures with clavulanic acid	ß-lactam inhibitors
Classical and semisynthetic erythromycins	Anti-infectives

Intermediates	Description
Various cephalosporin intermediates	Anti-infectives
Erythromycin base	Anti-infectives
Various crude compounds produced by fermentation	Cyclosporine, ascomysin, rapamycin, mycophenolic acid, etc.

Biopharmaceuticals

Product	Originator drug	Description
Omnitrope	Genotropin®	Recombinant human growth hormone
Binocrit and Epoetin alfa *Hexal*	Eprex®/Erypo®	Recombinant protein used for anemia
Zarzio, Zarxio and *Filgrastim Hexal*	Neupogen®	Recombinant protein used in oncology
Glatopa	Copaxone®	Treatment for multiple sclerosis (MS)
Erelzi	Enbrel®	Treatment for multiple inflammatory diseases
Rixathon	MabThera®	Treatment for blood cancers and immunological diseases
Hyrimoz	Humira®	Treatment for multiple inflammatory diseases
Zessly	Remicade®	Treatment for gastroenterological, rheumatological and dermatological diseases
Ziextenzo	Neulasta®	Treatment to reduce duration of chemotherapy-induced neutropenia and incidence of chemotherapy-induced febrile neutropenia with the exception of chronic myeloid leukemia and myelodysplastic syndromes

Biosimilars in Phase III development and registration

The following table describes Sandoz biosimilar projects that are in Phase III clinical trials (including filing preparation) and registration:

Project/ product	Common name	Mechanism of action	Potential indication/indications	Therapeutic areas	Route of administration	Current phase
GP2017	adalimumab	TNF- inhibitor	Arthritides (rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis), plaque psoriasis and others (same as originator)	Immunology	Subcutaneous	EU: Approved US: Registration
LA-EP2006	pegfilgrastim	Pegylated granulocyte colony-stimulating factor	Chemotherapy-induced neutropenia and others (same as originator)	Oncology	Subcutaneous	EU: Approved US[1]: Registration

[1] Resubmission planned for 2019 to address FDA complete response letter received June 2016

Principal markets

The two largest generics markets in the world – the US and Europe – are the principal markets for Sandoz. The following table sets forth the aggregate 2018 net sales of Sandoz by region:

Sandoz

	2018 net sales to third parties	
	USD millions	%

Europe	4 963	50
United States	2 754	28
Asia, Africa, Australasia	1 363	14
Canada and Latin America	779	8
Total	9 859	100
Of which in Established Markets *	7 233	73
Of which in Emerging Growth Markets *	2 626	27

* Emerging Growth Markets comprise all markets other than the Established Markets of the US, Canada, Western Europe, Japan, Australia and New Zealand.

Many Sandoz products are used for chronic conditions that require patients to consume the product over long periods of time, from months to years. Sales of our anti-infective products and over-the-counter cough and cold products are subject to seasonal variation. Sales of the vast majority of our other products are not subject to material changes in seasonal demand.

Production

The primary goal of our manufacturing and supply chain management program is to ensure the uninterrupted, timely and cost-effective supply of products that meet all product specifications and quality standards. The manufacture of our products is heavily regulated by governmental health authorities around the world, including the FDA and EMA. In addition to regulatory requirements, many of our products involve technically complex manufacturing processes or require a supply of highly specialized raw materials.

We manufacture our products at facilities worldwide. See also "—Item 4.D Property, plants and equipment." Active pharmaceutical ingredients are manufactured in our own facilities or purchased from third-party suppliers. We maintain state-of-the-art and cost-competitive processes, with quality as a primary goal within our own production network. Those processes include fermentation, chemical syntheses and precipitation processes, as well as sterile processing. Many biologic medicines are manufactured using recombinant DNA-derived technology, by which a gene is introduced into a host cell, which then produces a human protein. This manufacturing process requires sophisticated technical expertise. We are constantly working to improve current, and develop new, manufacturing processes, and to review and adapt our manufacturing network to meet the needs of our Sandoz Division.

Raw materials for the manufacturing process are either produced in-house or purchased from a number of third-party suppliers. Where possible, we maintain multiple supply sources so that the business is not dependent on a single or limited number of suppliers. However, our ability to do so may at times be limited by regulatory or other requirements. We monitor market developments that could have an adverse effect on the supply of essential materials. Our suppliers of raw materials are required to comply with Novartis quality standards.

Because the manufacture of our products is complex and heavily regulated by governmental health authorities, supply is never guaranteed. If we or our third-party suppliers fail to comply with applicable regulations, then there could be a product recall or other shutdown or disruption of our production activities. We have experienced supply interruptions for our products in the past, and there can be no assurance that supply will not be interrupted again in the future. We have implemented a global manufacturing strategy to maximize business continuity in case of such events. However, there can be no guarantee that we will always be able to successfully manage such issues when they arise.

Due to impurities found in valsartan, losartan, and ibersartan active ingredient batches sourced from a third party manufacturer, we recalled Sandoz valsartan, losartan and ibersartan products in the third and fourth quarters of 2018 in several countries, in line with our quality standards for all of our marketed products, and in agreement with local health authorities.

Marketing and sales

Sandoz sells a broad portfolio of products, including the products of our Retail Generics franchise and biosimilars, to wholesalers, pharmacies, hospitals and other healthcare outlets. Sandoz adapts its marketing and sales approach to local decision-making processes, depending on the structure of the market in each country.

In response to rising healthcare costs, many governments and private medical care providers, such as health maintenance organizations, have instituted reimbursement schemes that favor the substitution of bioequivalent generic versions of originator pharmaceutical products, such as those sold by our Retail Generics franchise. In the US, statutes have been enacted by all states that permit or require pharmacists to substitute a less expensive generic product for the brand-name version of a drug that has been prescribed to a patient. Generic use is growing in Europe, but penetration rates in many EU countries (as a percentage of volume) remain well below those in the US.

Recent trends have been toward continued consolidation among distributors and retailers of Sandoz products, both in the US and internationally, which has increased our customers' purchasing leverage.

Legislative or regulatory changes can have a significant impact on our business in a country. In Germany, for example, healthcare reforms have increasingly shifted decision-making from physicians to insurance funds.

Our Anti-Infectives franchise supplies active pharmaceutical ingredients and intermediates – mainly antibiotics – for internal use by Retail Generics and for sale to the pharmaceutical industry worldwide.

Our Biopharmaceuticals franchise operates in an emerging business environment, particularly in the US. Regulatory pathways for approving biosimilar products are either relatively new or still in development, and policies have not yet

been fully defined or implemented for the automatic substitution and reimbursement of biosimilars in many markets, including the US. As a result, in many of these markets, our biosimilar products are marketed as branded competitors to the originator products.

Competition

The market for generic products is characterized by increasing demand for high-quality pharmaceuticals that can be marketed at lower costs due to comparatively minimal initial research and development investments. Increasing pressure on healthcare expenditures and numerous patent and data exclusivity period expirations have encouraged more generic product launches,

resulting in increased competition among the companies selling generic pharmaceutical products, leading to ongoing price pressure. In particular, Sandoz faces increased industrywide pressure on prices for generic products, particularly in the US, driven by factors including customer consolidation and growing competition from other manufacturers of generic medicines. These factors contributed to a decline in US sales that began in 2017 and continued in 2018.

In addition, research-based pharmaceutical companies are participating directly in the generic conversion process by licensing their patented products to generic companies (so-called “authorized generics”). Consequently, generic companies that were not otherwise in a position to launch a specific product may participate in the market using the innovator’s product authorization. Authorized generics serve as a business opportunity for Sandoz when the product of a research-based pharmaceutical company loses patent protection and Sandoz secures a license from the research-based pharmaceutical company to launch the authorized generic of that product.

Development and registration

Development of Sandoz Biopharmaceuticals products is jointly overseen by Sandoz and by Novartis Global Drug Development. Development and registration activities for Retail Generics products, and certain registration activities for Biopharmaceuticals products, continue to be overseen directly by Sandoz.

Before a generic pharmaceutical may be marketed, intensive technical and clinical development work must be performed to demonstrate, in bioavailability studies, the bioequivalence of the generic product to the reference product. Nevertheless, research and development costs associated with generic pharmaceuticals generally are much lower than those of the originator pharmaceuticals, as no preclinical studies or clinical trials on dose finding, safety and efficacy must be performed by the generic company. As a result, generic pharmaceutical products can be offered for sale at prices often much lower than those of products protected by patents and data exclusivity, which must recoup substantial research and development costs through higher prices over the life of the product’s patent and data exclusivity period.

While generic pharmaceuticals are follow-on versions of chemically synthesized molecules, biosimilar products contain a version of the active substance of an already approved biological reference medicine. Due to the inherent variability and complexity of biologic products, including batch-to-batch differences and variations following manufacturing changes, the development and the regulatory pathway of biosimilars differ significantly from that of generics.

The development of a biosimilar product is much more technically challenging than the development of a typical generic pharmaceutical. While generic pharmaceuticals normally do not require clinical studies in patients, regulators worldwide do require such targeted studies for biosimilar products. Biosimilars are engineered to match the reference medicine in quality, safety and efficacy. This is achieved by systematically defining the target range of the reference medicine and then comparing the biosimilar to the reference medicine at various development stages to confirm biosimilarity and to establish that there are no clinically meaningful differences between the proposed biosimilar and the reference biologic. Because the purpose of a biosimilar clinical development program is to confirm biosimilarity and not to establish efficacy and safety de novo, the clinical studies required are less than those required for a reference biologic. Therefore, the cost of development for a biosimilar is usually less than that of a reference biologic.

The Development and Registration staff employed by affiliates of the Sandoz Division are based worldwide, including at facilities in Holzkirchen, Germany; Rudolstadt, Germany; Kundl, Austria; Ljubljana, Slovenia; Melville, New York; and Hicksville, New York. In 2018, the divestment of the Boucherville, Canada, development (and associated manufacturing) facility to Avara Pharmaceutical Services was announced and subsequently completed, including a long-term agreement to secure supply of key products to the Canadian market. Also in 2018, Sandoz announced the planned opening of a new development center in Hyderabad, India, initially focused on oral solid medicines.

Regulation

Generics

The Hatch-Waxman Act in the US (and similar legislation in the EU and in other countries) eliminated the requirement that manufacturers of generic pharmaceuticals repeat the extensive clinical trials required for reference products, so long as the generic version could be shown in bioequivalence studies to be of identical quality and purity, and to be therapeutically equivalent to the reference product.

In the US, the decision on whether a generic pharmaceutical is bioequivalent to the original patented product is made by the FDA based on an Abbreviated New Drug Application (ANDA) filed by the generic product’s manufacturer. The process typically takes nearly two years from the filing of the ANDA until FDA approval. However, delays can occur

if issues arise regarding the interpretation of bioequivalence study data, labeling requirements for the generic product, or qualifying the supply of active ingredients. In addition, the Hatch-Waxman Act requires a generic manufacturer to certify in certain situations that the generic product does not infringe on any current applicable patents on the product held by the holder of the marketing authorization for the reference product, or to certify that such patents are invalid or that the product is non-infringing. This certification often results in a patent infringement lawsuit being brought by the patent holder against the generic company. In the event of such a lawsuit, the Hatch-Waxman Act imposes an automatic 30-month delay in the approval of the generic product to allow the parties to resolve the intellectual property issues. For generic applicants who are the first to file their ANDA containing a certification claiming non-infringement or patent invalidity, the Hatch-Waxman Act provides those applicants with

180 days of marketing exclusivity to recoup the expense of challenging the patents on the reference product. However, generic applicants must launch their products within certain timeframes or risk losing the marketing exclusivity that they had gained by being a first-to-file applicant.

In the EU, decisions on the granting of a marketing authorization are made either by the European Commission based on a positive recommendation by the EMA under the centralized procedure, or by a single member state under the national or decentralized procedure. See "—Innovative Medicines—Regulation—European Union." Companies may submit Abridged Applications for approval of a generic medicinal product based upon its "essential similarity" to a medicinal product authorized and marketed in the EU following the expiration of the product's data exclusivity period. In such cases, the generic company is able to submit its Abridged Application based on the data submitted by the innovator company for the reference product, without the need to conduct extensive Phase III clinical trials of its own. For all products that received a marketing authorization in the EU after late 2005, the Abridged Application can be submitted throughout the EU. However, the data submitted by the innovator company in support of its application for a marketing authorization for the reference product will be protected for 10 years after the first grant of marketing authorization in all member states, and can be extended for an additional year if a further innovative indication has been authorized for that product, based on preclinical and clinical trials filed by the innovator company that show a significant clinical benefit in comparison to the existing therapies.

Biosimilars

The regulatory pathways for approval of biosimilar medicines are still being developed and established in many countries of the world. A regulatory framework for the approval of biosimilars has been established in the EU, Japan, Canada and the US, while the World Health Organization (WHO) has issued guidance. Sandoz has successfully registered and launched the first biosimilar (or biosimilar-type) medicine in Europe, the US, Canada, Japan, Taiwan, Australia, and many countries in Latin America and Asia. Sandoz was the first company to secure approval for and launch a biosimilar under the US biosimilar pathway that was established as part of the Biologics Price Competition and Innovation Act (BPCIA).

The approval of biosimilars in Europe follows a process similar to that followed for small molecules. However, biosimilars usually have to be approved through the centralized procedure because they are manufactured using recombinant DNA technology. As part of the approval process in the EU, biosimilars have to demonstrate comparability to the reference medicine in terms of safety, efficacy and quality through an extensive comparability exercise, based on strict guidelines set by the authorities. Regulators will only approve a biosimilar based on data that allows the regulators to conclude that there are no clinically meaningful differences between the reference medicine and the biosimilar.

In the US, under the BPCIA, a biosimilar must be highly similar with no clinically meaningful differences compared to the reference medicine. Approval of a biosimilar in the US requires the submission of a BLA to the FDA, including an assessment of immunogenicity, and pharmacokinetics or pharmacodynamics. The BLA for a biosimilar can be submitted as soon as four years after the initial approval of the reference biologic, but can only be approved 12 years after the initial approval of the reference biologic. This pathway is still relatively new, and some aspects remain untried and controversial.

Intellectual property

We take all reasonable steps to ensure that our products do not infringe valid intellectual property rights held by others. Nevertheless, competing companies commonly assert patent and other intellectual property rights. As a result, we can become involved in significant litigation regarding our products. If we are unsuccessful in defending these suits, we could be subject to injunctions preventing us from selling our products and to potentially substantial damages.

Wherever possible, our products are protected by our own patents. Among other things, patents may cover the products themselves, including the product's formulation, or the processes for manufacturing a product. However, there can be no assurance that our intellectual property will protect our products or that we will be able to avoid adverse effects from the loss of intellectual property protection in the future.

In October 2018, Sandoz announced a global resolution of all intellectual property-related litigation with AbbVie concerning adalimumab. Under the terms of the agreement, AbbVie grants Sandoz a non-exclusive license to AbbVie's intellectual property relating to Humira®, beginning on certain dates in certain countries in which AbbVie has intellectual property. Sandoz will pay royalties to AbbVie for licensing its Humira® patents. AbbVie will make no

payments to Sandoz.

Alcon

Our Alcon Division, a global leader in eye care, researches, develops, manufactures, distributes and sells eye care products. Its products are sold in more than 140 countries. In 2018, the Alcon Division had consolidated net sales of USD 7.1 billion, representing 14% of total Group net sales.

To meet the needs of patients, ophthalmologists, surgeons, optometrists, opticians and physician specialists, Alcon operates with two global business franchises: Surgical and Vision Care. Each business franchise operates with specialized sales forces and marketing support.

In November 2018, Novartis announced that Alcon had filed an initial Form 20-F registration statement with the SEC in relation to the previously announced intention of Novartis to spin off our Alcon Division as an

independent, publicly traded company. An application will be made to list the shares in Alcon on SIX and the NYSE under the ticker symbol “ALC.” In addition to shareholder approval, completion of the proposed Alcon spin-off remains subject to certain conditions precedent, such as no material adverse events, receipt of necessary authorizations as well as tax rulings and opinions. If approvals are secured and conditions are met, the spin-off is expected to be completed in the first half of 2019.

Effective January 1, 2018, we transferred our over-the-counter ophthalmic products and certain surgical diagnostic products from the Innovative Medicines Division to the Alcon Division. Our prescription ophthalmic medicines business remains with the Innovative Medicines Division. In compliance with IFRS, beginning with our first-quarter 2018 results, Novartis updated its segment financial information to reflect this transfer, both for the current and prior years, to aid comparability of year-on-year results. The products of the Ophthalmic Pharmaceuticals franchise of Alcon had previously been transferred to our Innovative Medicines Division following an internal reorganization announced on January 27, 2016.

In April 2016, Alcon entered into a strategic alliance with PowerVision to develop an accommodating intraocular lens (IOL) that has the potential to change focus via a fluid-driven shape-changing technology.

In December 2018, Alcon acquired 100% of TrueVision, the manufacturer of *NGENUITY*, a 3-D visualization system that combines a high-dynamic 3-D camera, advanced high-speed image optimization, polarizing surgeon glasses, and an ultra-high-definition 4K OLED 3-D display to create a platform for digitally assisted vitreoretinal surgery to help improve visualization of the delicate tissues in the back of the eye. Alcon has distributed *NGENUITY* since February 2016 under an exclusive agreement with TrueVision.

In December 2018, Alcon acquired 100% of Tear Film Innovations, Inc., for its *iLux* Device, a therapeutic device used to treat meibomian gland dysfunction (MGD), a leading cause of dry eye.

Alcon Division products

Surgical

Our Alcon Division’s Surgical franchise is the leader in global ophthalmic surgical product sales, offering implantable products, consumables, instruments and equipment for use in surgical procedures to address cataracts, vitreoretinal conditions, refractive errors and glaucoma. We also offer service on the equipment we sell.

The Alcon Surgical portfolio includes IOLs and equipment for use in cataract procedures; equipment, instruments and devices for use in vitreoretinal surgeries; surgical equipment and diagnostic devices used in refractive surgical procedures; and devices for use in treating patients with glaucoma. Our IOL portfolio includes our *Clareon* and *AcrySof* IOL families, with options ranging from monofocal IOLs for basic cataract surgery to specialized IOLs for the correction of presbyopia and astigmatism at the time of cataract surgery; as well as the *UltraSert* and *AutonoMe* innovative IOL delivery systems. The Cataract Refractive Suite by Alcon features the *Centurion* vision system for phacoemulsification and cataract removal; the *Infiniti* vision system for phacoemulsification and cataract removal; the *LenSx* femtosecond laser used for specific steps in the cataract surgical procedure; the *LuxOR* ophthalmic microscope; the *ORA SYSTEM* technology for cataract surgery planning and intra-operative guidance during surgery; and the *Verion* imaged guided system for use during cataract surgery. The Alcon vitreoretinal portfolio includes the *NGENUITY* 3D visualization system, designed to enhance visualization of the back of the eye, and the *Constellation* vision system and associated handpieces and instruments. Our *WaveLight* devices are used for LASIK and other vision-correcting refractive procedures, including topography-guided procedures marketed under the *Contoura* brand. For glaucoma surgery, Alcon offers the *EX-PRESS* glaucoma filtration device, and formerly distributed the *CyPass* Micro-Stent. However, in August 2018, Alcon voluntarily withdrew the *CyPass* Micro-Stent from the global market based on analysis of five-year post-surgery data from the COMPASS-XT long-term safety study. In addition, Alcon provides advanced viscoelastics, surgical solutions, diagnostic ophthalmic products, surgical packs, and other disposable products for cataract and vitreoretinal surgery.

Vision Care

Our Alcon Division’s Vision Care franchise develops and markets contact lenses and ocular health products. Alcon’s broad portfolio of silicone hydrogel, daily disposable and color contact lenses includes our *Dailies, Air Optix* and *Freshlook* brands. Our *Dailies* product line includes the *Dailies Total1* lens, a first-of-its-kind water gradient contact lens that is also offered in a multifocal option for patients with presbyopia. Our *Air Optix* monthly replacement product line features silicone hydrogel contact lenses in monofocal, astigmatism-correcting and multifocal options, as well as *Air Optix* Colors and *Air Optix* plus *HydraGlyde* contact lenses. Our contact lens care solutions business

includes the *Opti-Free* line of multipurpose disinfecting solutions, as well as the *Clear Care* and *AOSEPT* Plus line of hydrogen peroxide lens care solutions. Over-the-counter ophthalmic products that have moved from our Innovative Medicines Division to the Alcon Vision Care franchise include artificial tear and related dry eye products marketed under the *Systane*, *Tears Naturale* and *Genteal* brands; *Naphcon A* and *Zaditor* eye drops for the temporary relief of ocular itching due to allergies; and vitamins for ocular health, marketed under the *ICAPS* and *Vitalux* brands. With the acquisition of Tear Film, the Alcon Vision Care portfolio also includes the *iLux* Device, a therapeutic device used to treat MGD, a leading cause of dry eye.

New products

We received a number of approvals and launched a number of products in 2018, including:

• *Systane* Complete was launched in the US and EU. This addition to the *Systane* product line offers fast hydration and lasting relief, with nano droplet technology for enhanced coverage.

• *Air Optix* plus *HydraGlyde* multifocal contact lenses launched in the US and EU. These lenses offer clear, seamless vision at all distances and combine the innovative *Air Optix* multifocal design with lasting lens surface moisture provided by the *HydraGlyde* moisture matrix.

Key marketed products

The following tables set forth certain key marketed products in our Alcon Division. While we intend to sell our marketed products throughout the world, not all products and indications are currently available in every country.

Surgical	
Cataract	*AcrySof* family of IOLs, including:
	AcrySof IQ monofocal IOLs
	AcrySof IQ Toric astigmatism-correcting IOLs
	AcrySof IQ *ReSTOR* presbyopia-correcting IOLs
	AcrySof IQ *ReSTOR* Toric presbyopia- and astigmatism-correcting IOLs
	AcrySof IQ *PanOptix* presbyopia-correcting IOLs
	AcrySof IQ *PanOptix* Toric presbyopia- and astigmatism-correcting IOLs
	AutonoMe pre-loaded IOL delivery system
	Cataract Refractive Suite by Alcon, including:
	Centurion vision system for phacoemulsification and cataract removal
	Infiniti vision system for phacoemulsification and cataract removal
	LenSx femtosecond laser used for specific steps in the cataract surgical procedure
	LuxOR ophthalmic microscope
	ORA SYSTEM technology for cataract surgery planning and intra-operative guidance during surgery
	Verion imaged-guided system for use during cataract surgery
	Clareon monofocal IOLs
	UltraSert pre-loaded IOL delivery system
Vitreoretinal	*Constellation* vision system for vitreoretinal operations
	Grieshaber surgical instruments
	NGENUITY 3D visualization system
	Purepoint laser system and probes
	Ultravit vitrectomy probes
Refractive	*WaveLight EX500* excimer laser for LASIK and other refractive correction procedures
	WaveLight FS200 femtosecond laser for refractive surgery
Glaucoma	*EX-PRESS* glaucoma filtration device

In addition, Alcon provides advanced viscoelastics, surgical solutions, surgical packs, diagnostic ophthalmics, and other disposable products for cataract and vitreoretinal surgery.

Vision Care	
Contact lenses	*Air Optix* family of silicone hydrogel contact lenses (including *Air Optix* Colors and *Air Optix* plus *HydraGlyde* lenses)
	Dailies family of daily disposable contact lenses (including *Dailies Total1* lenses)
	FreshLook family of color contact lenses
Contact lens care	*Clear Care* family of hydrogen peroxide lens care solution (*AOSEPT* Plus outside of North America)
	Opti-Free family of multipurpose disinfecting solution
Dry eye	*Genteal* family of artificial tears
	Systane family of artificial tears and related dry eye products
	Tears Naturale lubricant eye drops
	iLux Device for the treatment of MGD, a leading cause of dry eye

Allergy	*Naphcon A* for the temporary relief of ocular redness and itching due to allergies
	Zaditor for the temporary relief of ocular itching due to allergies
Vitamins	*ICAPS* and *Vitalux* families of eye vitamin products

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Principal markets

The principal markets for our Alcon Division include North America, Latin America, Japan, Asia and Europe. The following table sets forth the aggregate 2018 net sales of the Alcon Division by region:

Alcon

	2018 net sales to third parties	
	USD millions	%
Europe	1 805	25
United States	2 942	41
Asia, Africa, Australasia	1 781	25
Canada and Latin America	621	9
Total	7 149	100
Of which in Established Markets *	5 395	75
Of which in Emerging Growth Markets *	1 754	25

* Emerging Growth Markets comprise all markets other than the Established Markets of the US, Canada, Western Europe, Japan, Australia and New Zealand.

Sales of the vast majority of our Alcon Division products are not subject to material changes in seasonal demand. However, sales of certain of our Vision Care products, including those for allergies and dry eye, are subject to seasonal variation.

Research and development

Alcon has made one of the largest commitments to research and development in the eye care devices market, with proven R&D capabilities in the areas of optical design, material and surface chemistry, automation and equipment platforms. Currently, our Alcon Division research and development organization employs over 1 200 individuals dedicated to its research and development efforts, including physicians, doctors of optometry, and Ph.Ds. Alcon researchers have extensive experience in the field of ophthalmology and frequently have academic or practitioner backgrounds to complement their product development experience.

Research and development activities for Alcon's Surgical franchise are focused on expanding intraocular lens capabilities to further improve surgical and refractive outcomes, and on developing equipment and instrumentation for cataract, vitreoretinal, refractive and glaucoma surgeries, as well as new platforms for diagnostics and visualization.

The focus of the Vision Care franchise is on the research and development of new manufacturing platforms, novel contact lens materials, coatings and optical designs for various lens replacement schedules with the ultimate goal of improving patient outcomes, and novel delivery systems that safely deliver products that provide relief from symptoms of dry eye and ocular allergies.

Alcon continues to seek opportunities to collaborate with third parties on advanced technologies for various ophthalmic conditions. These include the potential to provide accommodative contact and intraocular lenses for patients living with presbyopia.

Production

The manufacture of our products is heavily regulated by governmental health authorities around the world, including the FDA. In addition to regulatory requirements, many of our products involve technically complex manufacturing processes or require a supply of highly specialized raw materials. For some products and raw materials, we may also rely on a single source of supply. The combination of these factors means that supply is never guaranteed.

Like some of our competitors, our Alcon Division faces manufacturing issues from time to time. If we or our third-party suppliers fail to comply fully with regulations, then there could be a product recall or other shutdown or disruption of our production activities. There can be no assurance that we will not experience supply interruptions for our products in the future. We have implemented a global manufacturing strategy to maximize business continuity in case of such events. However, there can be no guarantee that we will be able to successfully manage such issues if and when they arise. For additional information on Alcon production facilities, see "Item 4. Information on the Company—Item 4.D Property, plants and equipment."

Marketing and sales

Our Alcon Division conducts sales and marketing activities around the world, organized under five operating regions: Europe (including Russia)/Middle East/Africa, North America, Latin America/Caribbean, Asia and Japan. The Alcon Division's global commercial capability is organized around sales and marketing organizations dedicated to the Surgical and Vision Care franchises.

Most of our global Alcon marketing efforts are supported by advertising in trade publications and by marketing and sales representatives attending regional and national medical conferences. Marketing efforts are reinforced by targeted and timely promotional materials and direct mail to eye care practitioners in the office, hospital or surgery center setting. Technical service after the sale is provided, and an integrated customer relationship management system is in place in many markets. We also rely on direct-to-consumer marketing campaigns to promote selected products.

While our Alcon Division markets all of its products by calling on medical professionals, direct customers and distribution methods differ across business lines. Alcon Surgical products are sold directly to hospitals and ambulatory surgical centers, although Alcon sells through distributors in certain markets outside the US. In most countries, contact lenses are available only by prescription. Our contact lenses can be purchased from eye care professionals, optical chains and large retailers, subject to country regulation. Over-the-counter lens care, dry eye, allergy and ocular vitamin products can be found in major drugstore, food, mass merchandising and optical retail chains globally, subject to country regulations.

Competition

The eye care industry is highly competitive and subject to rapid technological change and evolving industry requirements and standards. Our Alcon Division competes with a number of different companies across its two franchises. Companies within this industry compete on technological leadership and innovation, quality and efficacy of their products, relationships with eye care professionals and healthcare providers, breadth and depth of product offerings, and pricing. The presence of these factors varies across our Alcon Division's product offerings. Our principal competitors also sometimes form strategic alliances and enter into co-marketing agreements in an effort to better compete.

Regulation

Most of our Surgical products and many of our Vision Care products are regulated as medical devices in the US and the EU. These jurisdictions each have risk-based classification systems that determine the type of information that must be provided to the local regulatory bodies in order to obtain the right to market a product. In the US, safety and effectiveness information for Class II and III devices must be reviewed by the FDA. Our Class II and Class III devices typically are subject to one of the following two pre-market review procedures: the Pre-Market Approval (PMA) process typically applies to Class III devices, and the Pre-Market Notification (510(k)) submission process typically applies to Class II devices. Under a PMA, the manufacturer must submit to the FDA supporting evidence sufficient to prove the safety and effectiveness of the device. Under a 510(k) submission, the manufacturer notifies the FDA that it intends to commence marketing the product, with data that establishes the product as substantially equivalent to another already-marketed Class II product.

In the EU, CE marking is required for all medical devices sold. By affixing the CE Mark, the manufacturer certifies that a product is in compliance with provisions of the EU's Medical Device Directive. Most such products are subject to a self-certification process by the manufacturer, which requires the manufacturer to confirm that the product performs to appropriate standards. This allows the manufacturer to issue a Declaration of Conformity and to notify competent authorities in the EU that the manufacturer intends to market the product. In order to comply with European regulations, our Alcon Division maintains a full Quality Assurance system and is subject to routine auditing by a certified third party (a "notified body") to ensure that this quality system is in compliance with the requirements of the EU's Medical Device Directive as well as the requirements of ISO 13485.

Many of our Vision Care dry eye and allergy products are regulated as over-the-counter pharmaceuticals in the US, and several Surgical diagnostic ophthalmic products are regulated as prescription pharmaceuticals in the US and the EU. In the US, over-the-counter pharmaceuticals that comply with the FDA over-the-counter monograph regulations may be marketed without prior FDA approval. Alcon's prescription pharmaceutical products are subject to the same regulatory approval procedures as the prescription pharmaceutical products of our Innovative Medicines Division. See "—Innovative Medicines—Regulation."

Price controls

The prices of our Surgical devices and our drugs that require a prescription are subject to reimbursement programs and price control mechanisms that vary from country to country. Due to increasing political pressure and governmental budget constraints, we expect these programs and mechanisms to remain robust – and to potentially even be strengthened. As a result, such programs and mechanisms could have a negative influence on the prices we are able to charge for our Surgical products, particularly those used in cataract and vitreoretinal surgeries.

For example, in India, the National Pharmaceutical Pricing Authority (NPPA) has imposed 75% to 85% price reductions on coronary stents (implantable medical devices intended to ensure an adequate flow of blood to the heart). The NPPA has begun to evaluate prices on other categories of medical devices, potentially including IOLs used in cataract surgeries. If the NPPA chooses to impose similar price reductions on IOLs from Alcon, this could have a negative impact on our Surgical franchise sales in India. It is also possible that regulatory agencies in other countries may consider applying similar price controls on IOLs and other Surgical products sold by Alcon.

Intellectual property

We strive to protect our investment in the research, development, manufacturing and marketing of our

products through the use of patents, trademarks, copyrights, trade secrets and other intellectual property. In general, we seek intellectual property protection under applicable laws for significant product developments in major markets. Among other things, patents may cover the products themselves, the processes for manufacturing a product, and particular uses of a product.

The protection offered by our intellectual property extends for varying periods, depending on its legal life in the various countries. The protection afforded, which may also vary from country to country, depends upon the type of intellectual property and its scope of coverage. We monitor infringements of our intellectual property and typically challenge such infringements. We also defend challenges through litigation and administrative proceedings to the validity of our intellectual property. However, because the outcomes of intellectual property challenges can be difficult to predict, there can be no assurance that we will be able to successfully protect our intellectual property rights in all cases. If we are unsuccessful in defending such challenges, we may face loss of exclusivity and increased competition in the affected territories. See generally "—Innovative Medicines—Intellectual property."

We take reasonable steps to ensure that our products do not infringe valid intellectual property rights held by others. Nevertheless, third parties may assert patent and other intellectual property rights against our products. As a result, we can become involved in significant intellectual property litigation regarding our products. If we are unsuccessful in defending these suits, we could be subject to injunctions preventing us from selling our products and to damages that may be substantial.

In addition to our patents and pending patent applications in the United States and selected non-US markets, we rely on proprietary know-how and trade secrets in our businesses and work to ensure the confidentiality of this information, including through the use of confidentiality agreements with employees and third parties. In some instances, we also acquire, or obtain licenses to, intellectual property rights that are important to our businesses from third parties.

All of our major Alcon Division products are sold under trademarks that we consider in the aggregate to be important to our Alcon Division business as a whole. We consider trademark protection to be particularly important to the protection of our investment in the sales and marketing of our Vision Care franchise. The scope and duration of trademark protection varies widely throughout the world. In some countries, trademark protection continues only as long as the mark is used. Other countries require the registration of trademarks and the payment of registration fees. Trademark registrations are generally for fixed, but renewable, terms.

We rely on copyright protection in various jurisdictions to protect the software and printed materials our business relies upon, including software used in our surgical and diagnostic equipment. The scope of copyright protection for computer software varies throughout the world, although it is generally for a fixed term that begins on the date of copyright registration.

4.C Organizational structure

Organizational structure

See “Item 4. Information on the Company—Item 4.A History and development of Novartis,” and “Item 4. Information on the Company—Item 4.B Business overview—Overview.”

Significant subsidiaries

See “Item 18. Financial Statements—Note 31. Principal Group subsidiaries and associated companies.”

4.D Property, plants and equipment

Our principal executive offices are located in Basel, Switzerland. Our divisions operate through a number of affiliates that have offices, research and development facilities, and production sites throughout the world.

We generally own our facilities or have entered into long-term lease arrangements for them. Some of our principal facilities are subject to mortgages and other security interests granted to secure indebtedness to certain financial institutions.

Novartis Technical Operations manages the production and supply chains of our Innovative Medicines and Sandoz Division products through a network of 64 manufacturing sites, as well as through external suppliers, and warehouse and distribution centers. Our Alcon Surgical and Vision Care manufacturing sites continue to be managed by the Alcon Division. In addition, following the transition of our over-the-counter ophthalmic products and certain surgical diagnostics products to Alcon, and the overall strategic decision to create greater operational autonomy for our Alcon Division, management of the manufacturing site in Fort Worth, Texas, was transferred back to Alcon on July 1, 2018, and our aseptic manufacturing site in Singapore was transferred to Alcon on January 1, 2019. Our Puurs, Belgium, site will remain within Novartis Technical Operations, with the exception of Alcon *Custom Pak* production and warehousing, which was transferred to Alcon on January 1, 2019. AAA manages four sites for radioligand therapies production, and certain other small sites for diagnostics and enriched water production. AveXis manages five sites for research and development, production, warehousing, its headquarters and administrative offices. Endocyte manages two sites for research and its headquarters and administrative offices.

The following table sets forth our major headquarters and most significant production, research and development, and administrative facilities. See also "—Item 4.B Business overview—Innovative Medicines—Production," "—Item 4.B Business overview—Sandoz—Production" and "—Item 4.B Business overview—Alcon—Production" for a discussion of our manufactu processes.

Major facilities

Location	Size of site (in square meters)	Major activity
Basel, Switzerland – St. Johann	724 000	Global Group headquarters, global Innovative Medicines Division headquarters, research and development, production of drug substances and drug intermediates
Kundl and Schaftenau, Austria	480 000	Production of biotechnological products, drug products and finished products, anti-infectives, active drug substances, product development
East Hanover, New Jersey	391 000	Innovative Medicines Division US headquarters, research and development
Barleben, Germany	340 000	Production of broad range of generics finished dosage forms
Fort Worth, Texas	315 200	Alcon Division US headquarters; production, research and development for Alcon Vision Care and Surgical franchises; Novartis Finance Service Center
Changshu (Suzhou), China	230 000	Technical research, development and manufacturing of drug substances and drug intermediates
Cambridge, Massachusetts	205 000	Research and development
Shanghai, China	106 500	Research and development
Ringaskiddy, Ireland	85 000	Production of drug substances and drug intermediates
Johns Creek, Georgia	84 100	Production, research and development for Alcon Vision Care franchise
Ljubljana, Slovenia	83 000	Production of broad range of finished solid and sterile dosage forms
Hyderabad, India	80 500	General administrative and development global service center
Grosswallstadt, Germany	65 200	Production, research and development for Alcon Vision Care franchise
Stein, Switzerland	64 700	Production of sterile vials, pre-filled syringes and ampoules, and of inhalation capsules, tablets and transdermals, and of active pharmaceutical ingredients
Holzkirchen, Germany	64 200	Sandoz Division global headquarters, production of oral films, transdermal delivery systems, matrix patches, product development
Grimsby, UK	64 000	Production of drug substances and drug intermediates
Menges, Slovenia	62 400	Production of drug substances and drug intermediates
Puurs, Belgium	55 000	Production for Innovative Medicines ophthalmic products and Alcon Surgical franchise
Kurtkoy, Turkey	51 700	Production of Innovative Medicines solids
Stryków, Poland	45 000	Production of broad range of bulk oral solid forms and packaging
Rudolstadt, Germany	44 000	Development and production of respiratory technologies and ophthalmics
Johor, Malaysia	43 900	Production for Alcon Vision Care franchise
Rueil-Malmaison, France	43 700	Administrative offices for Innovative Medicines and Alcon
Irvine, California	40 800	Production, research and development for Alcon Surgical franchise
Torre, Italy	40 100	Production of Innovative Medicines solids
Houston, Texas	37 400	Production for Alcon Surgical franchise
Batam, Indonesia	35 000	Production for Alcon Vision Care franchise
Huningue, France	35 000	Production of drug substances for clinical and commercial supply
Singapore	35 000	Production for Alcon Vision Care franchise and Innovative Medicines solids and biologics
Barbera, Spain	33 000	Production of tablets, capsules and inhalation products
	31 700	Production of drug substances and drug intermediates

Basel, Switzerland – Schweizerhalle		
Wehr, Germany	31 700	Production of tablets and packaging
Huntington, West Virginia	27 500	Production for Alcon Surgical franchise
Tokyo, Japan	26 000	Administrative offices for Innovative Medicines, Sandoz and Alcon
Sasayama, Japan	23 300	Packaging site for Innovative Medicines
Sinking Spring, Pennsylvania	21 800	Production for Alcon Surgical franchise
Morris Plains, New Jersey	15 600	Production for Innovative Medicines Division cell and gene therapies
Princeton, New Jersey	14 300	Sandoz Division US headquarters
Cork, Ireland	13 600	Production for Alcon Surgical franchise
Libertyville, Illinois	9 800	Production, warehouse, and administrative offices for AveXis
Targu Mures, Romania	9 070	Production of solids for Innovative Medicines and Sandoz
Schaffhausen, Switzerland	4 100	Production for Alcon Surgical franchise
La Jolla, California	3 300	Research and development, and quality control testing for AveXis
Bannockburn, Illinois	3 000	AveXis headquarters
West Lafayette, Indiana	2 000	Headquarters, research laboratory and administrative offices for Endocyte
Millburn, New Jersey	1 400	AAA primary production site for radioligand therapy
Colleretto Giacosa/Ivrea, Italy	1 200	AAA primary production site for radioligand therapy
Saint-Genis-Pouilly, France	600	AAA global headquarters

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To support the objectives of Novartis Technical Operations, we are progressing with our network transformation project, under which we are reviewing our manufacturing network to ensure it can appropriately meet the future needs of the Group. Under this transformation plan, we have made the following announcements:

• In May 2017, we announced the planned closure of one manufacturing building at each of our Basel, Switzerland, and Schweizerhalle, Switzerland, sites by 2019.

• In October 2017, we announced our plan to close commercial production operations at our Broomfield, Colorado, site, with production anticipated to conclude during 2019.

• In November 2017, we announced our plan to exit our packaging operations in Wehr, Germany, by 2022.

• In April 2018, we announced the planned closure of our Kaminoyama, Japan, site and the transfer of all packaging activities to Sasayama, Japan, by 2020.

• In May 2018, we announced an agreement with Avara Pharmaceutical Services to divest our Boucherville, Canada, plant. This divestment was completed on September 1, 2018.

• In September 2018, we announced that Aurobindo Pharma USA Inc. agreed to acquire our manufacturing facilities in Wilson, North Carolina; Hicksville, New York; and Melville, New York, as part of the divestment of the US dermatology business and generic US oral solids portfolio of our Sandoz Division. We expect this transaction to be completed during the course of 2019.

• In September 2018, we announced the acquisition of our Mahad, India, site by Olon S.p.A., which we expect to be completed in 2019.

• Also in September 2018, we announced the proposed exit of manufacturing operations in Grimsby, United Kingdom, as well as the closure of a building in Schweizerhalle, Switzerland, by 2020 and the milling and blending center in Stein, Switzerland, by 2021.

• In December 2018, we announced the transfer of the packaging and repackaging activities from our Candelaria, Mexico, site to a local contract manufacturer in 2019.

• In December 2018, we announced an offer to acquire Cell*for*Cure from LFB, including its cell and gene manufacturing facility located in Les Ulis, France. If this transaction closes as planned, Cell*for*Cure is expected to become a wholly owned Novartis manufacturing site managed by NTO. We expect this transaction to be completed during the first half of 2019.

• In December 2018, we completed the exit of our site in Turbhe, India.

In 2012, Novartis announced the construction of a new state-of-the-art production facility to produce solid dosage form medicines for the Innovative Medicines Division in Stein, Switzerland. We expect our investment in this facility to exceed USD 0.6 billion. The new facility is planned to replace an older facility. In addition, Novartis is investing in new technologies and packaging facilities for pharmaceuticals at Stein. Stein is a technological competence center for both sterile and solid dosage form drugs. Through December 31, 2018, the total amount paid and committed to be paid on this project is equivalent to approximately USD 0.6 billion.

In 2012, we announced the planned construction of a new state-of-the-art biotechnology production site in Singapore, with a planned investment of over USD 0.8 billion. The new facility will focus on drug substance manufacturing based on cell culture technology. Ground was broken in February 2013, and construction was completed in the third quarter of 2015 for phase one of the project. Phase one of this project is now operational, and we expect phase two to be operational in 2019. The facility is co-located with the pharmaceutical production site based in Tuas, Singapore. In the future, Singapore is expected to be a technological competence center for both biotechnology and pharmaceutical manufacturing at Novartis. Through December 31, 2018, the total amount paid and committed to be paid on this project is equivalent to USD 0.7 billion.

An expansion of our Alcon Division's Johns Creek, Georgia, facility was approved in 2017 to add three production lines of *Dailies Total1* contact lenses. This project is still in progress. We expect to pay a total amount of approximately USD 0.1 billion on this project. Through December 31, 2018, the total amount paid and committed to be paid on this project is approximately USD 0.1 billion.

In March 2018, the second phase of expansion of the Grosswallstadt, Germany, and Singapore facilities relating to the production of contact lenses was approved. We expect to pay a total amount of approximately USD 0.4 billion on the Grosswallstadt project and approximately USD 0.1 billion on the Singapore project, in each case for both the first and second phases of expansion. Through December 31, 2018, the total amount paid and committed to be paid on the Grosswallstadt project is equivalent to approximately USD 0.3 billion, and the total amount paid and committed to be

paid on the Singapore project is equivalent to approximately USD 0.1 billion.

In July 2018, AveXis initiated construction of a new 15 800-square-meter state-of-the-art gene therapy manufacturing facility in Durham, North Carolina. The new facility is expected to complement the existing AveXis site in Libertyville, Illinois, and allow for production of multiple gene therapy products simultaneously. The site is expected to be fully operational in 2020. We expect to pay a total amount of USD 0.2 billion. Through December 31, 2018, the total amount paid and committed to be paid on this project is approximately USD 0.1 billion.

In August 2018, Novartis Technical Operations announced its plan to establish a European cell and gene therapy hub in Stein, Switzerland. We expect our investment in this project to exceed USD 0.1 billion. Through December 31, 2018, the total amount paid and committed to be paid on this project is equivalent to USD 22 million.

In November 2018, Novartis announced the construction of a new state-of-the-art advanced integrated biologics manufacturing facility in Schaftenau, Austria. We expect our investment in this facility to exceed USD 0.2 billion. We expect phase one of this project to be operational in 2020. Through December 31, 2018, the total amount paid and committed to be paid on this project is equivalent to approximately USD 0.1 billion.

Environmental matters

We integrate core values of environmental protection into our business strategy to protect the environment, add value to the business, manage risk and enhance our reputation. For example, our Executive Committee recently endorsed new targets for environmental sustainability related to our carbon footprint, waste production and water sustainability, and we announced a virtual power purchase agreement for renewable energy.

We are subject to laws and regulations concerning the environment, safety matters, regulation of chemicals, and product safety in the countries where we manufacture and sell our products or otherwise operate our business. These requirements include regulation of the handling, manufacture, transportation, use and disposal of materials, including the discharge of pollutants into the environment. In the normal course of our business, we are exposed to risks relating to possible releases of hazardous substances into the environment that could cause environmental or property damage or personal injuries, and that could require remediation of contaminated soil and groundwater – in some cases over many years – regardless of whether the contamination was caused by us or by previous occupants of the property.

See “Item 3. Key Information—Item 3.D Risk factors—Environmental, social and governance matters may impact our business and reputation,” and “Item 3. Key Information—Item 3.D Risk factors—Environmental liabilities may adversely impact our financial results.” See also “Item 4. Information on the Company—Item 4.B Business overview—Overview—Corporate responsibility,” and “Item 18. Financial Statements—Note 19. Provisions and other non-current liabilities.”

Item 4A. Unresolved Staff Comments

Not applicable.

Item 5. Operating and Financial Review and Prospects

5.A Operating results

This operating and financial review should be read together with the Group's consolidated financial statements in this Annual Report, which have been prepared in accordance with International Financial Reporting Standards (IFRS) as published by the International Accounting Standards Board (see "Item 18. Financial Statements"). "Item 5 Operating and Financial Review and Prospects" together with the sections on compounds in development and key development projects of our divisions (see "Item 4. Information on the Company-Item 4.B Business overview") constitute the Operating and Financial Review ("Lagebericht"), as defined by the Swiss Code of Obligations.

Overview

As a leading global medicines company, we use innovative science and digital technologies to create transformative treatments in areas of great medical need. Our purpose is to reimagine medicine to improve and extend people's lives. Our vision is to be a trusted leader in changing the practice of medicine. Our strategy is to focus Novartis as a leading medicines company powered by advanced therapy platforms and data science.

The Group comprises three global operating divisions and we separately report the results of Corporate activities:

- Innovative Medicines: innovative patent protected prescription medicines
- Sandoz: generic pharmaceuticals and biosimilars
- Alcon: surgical and vision care products
- Corporate activities

The financial results of our Corporate activities include the costs of the Group headquarters and those of corporate coordination functions in major countries. In addition, Corporate includes other items of income and expense that are not attributable to specific segments such as certain revenues from intellectual property rights and certain expenses related to post employment benefits, environmental remediation liabilities, charitable activities, donations and sponsorships.

In June 2018, we announced that we plan to spin off Alcon into a separately-traded standalone company. As two distinct publicly traded companies, we believe Novartis and Alcon will be better positioned to capitalize on significant growth opportunities and focus resources on their respective businesses and strategic priorities.

Our divisions are supported by the following cross-divisional organizational units: the Novartis Institutes for BioMedical Research, Global Drug Development, Novartis Technical Operations and Novartis Business Services. The financial results of these organizational units are included in the results of the divisions for which their work is performed. As part of the planned spin-off of Alcon, efforts are being undertaken to prepare for the separation of Alcon from Novartis and to enable Alcon to operate as a standalone public company. As part of these efforts, Alcon is forming its own supporting functions and service organizations.

As part of the long-term strategy to build a leading, focused medicines company powered by advanced therapy platforms and data science, we announced and/or completed several acquisitions and divestments during 2018, 2017 and 2016. For a description of these acquisitions and divestments and other significant transactions, refer to "Item 4.A History and development of Novartis – Important Corporate developments 2016 – 2018", and "Item 18. Financial Statements – Note 2. Significant transactions" and "Note 30. Events subsequent to the December 31, 2018, consolidated balance sheet date – proposal to the Annual General Meeting of Shareholders to approve a spin-off transaction of the Alcon Division".

During 2018 and 2017 Novartis announced several new nominations to the Executive Committee of Novartis including the appointment of Vasant (Vas) Narasimhan, M.D., Global Head of Drug Development and Chief Medical Officer, as CEO of Novartis, effective February 1, 2018. For a more detailed description of these nominations please refer to "Item 4. Information on the Company – Item 4.B Business overview".

In 2018, Novartis achieved net sales of USD 51.9 billion, of which USD 13.0 billion, or 25%, came from Emerging Growth Markets, and USD 38.9 billion, or 75%, came from Established Markets. Emerging Growth Markets comprise all markets other than the Established Markets of the US, Canada, Western Europe, Japan, Australia and New Zealand.

Innovative Medicines accounted for USD 34.9 billion, or 67%, of Group net sales, and for USD 7.9 billion, or 87%, of Group operating income (excluding Corporate income and expense, net).
Sandoz accounted for USD 9.9 billion, or 19%, of Group net sales, and for USD 1.3 billion, or 15%, of Group operating income (excluding Corporate income and expense, net).
Alcon accounted for USD 7.1 billion, or 14%, of Group net sales, and an increased operating loss of USD 0.2 billion.
Effective January 1, 2018, following the internal reorganization, announced on October 24, 2017, and January 24, 2018, we transferred our over-the-counter ophthalmic products and certain surgical diagnostic products with sales in 2017 of USD 747 million (2016: USD 731 million) from the Innovative Medicines Division to the Alcon Division. Our prescription Ophthalmic medicines business remains with the Innovative Medicines Division. As

the Innovative Medicines Division will discontinue its use of the Alcon brand name, the intangible asset has been transferred from corporate to the Alcon Division. In compliance with IFRS, we updated our segment reporting to reflect this transfer, both for the current and prior years, to aid comparability of year-on-year results. This restatement had no impact on the reported financial results of the Sandoz Division or the total Group.

Opportunity and risk summary

Our financial results are affected to varying degrees by external factors. The healthcare industry is entering a phase of significant progress and change. Over the next two decades, we believe biomedical innovation will continue to accelerate – potentially spawning new treatments that could have unparalleled impact on humanity, including in areas such as cancer and heart disease. The digital revolution that is now gaining momentum in healthcare is likely to transform everything from drug research and development to how doctors diagnose and treat diseases.

These trends could help society address the changing healthcare needs of aging populations and produce better health outcomes for patients. At the same time, loss of market exclusivity and the introduction of branded and generic competitors could significantly erode sales of our innovative products. Our ability to grow depends on the success of our research and development efforts to replenish our pipeline, as well as on the commercial acceptance of our products in the markets. Increased pricing pressure could impact our ability to generate returns and invest for the future.

We have a significant global compliance program in place, but any failure to comply with local laws could lead to substantial liabilities. Our manufacturing processes are technically complex and subject to strict regulatory requirements, which introduce a greater chance for disruptions and liabilities.

Our dependence on information technology puts us at risk of information security threats and losses of personal data. We may also fail to take advantage of rapid progress in digital technologies and in the development of new business models, and third parties may enter the healthcare field and could supplant portions of our business

We carry a significant amount of goodwill and other intangible assets on our consolidated balance sheet, and may incur significant impairment charges in the future. We pay taxes in numerous countries, and tax authorities around the world have increased their scrutiny of company tax filings. In addition, tax reform initiatives by the OECD, the EU, Switzerland and the US will require us to continually assess our organizational structure against tax policy trends, could lead to an increased risk of international tax disputes and an increase in our effective tax rate, and could adversely affect our financial results.

For more details on these trends and how they could impact our results, see “—Factors affecting results of operations” starting on page 105.

Results of operations
2018 compared to 2017
Key figures

(USD millions unless indicated otherwise)	Year ended Dec 31, 2018	Year ended Dec 31, 2017	Change in USD %	Change in constant currencies %
Net sales to third parties	51 900	49 109	6	5
Other revenues	1 266	1 026	23	23
Cost of goods sold	– 18 407	– 17 175	– 7	– 6
Gross profit	34 759	32 960	5	5
Selling, general and administration	– 16 471	– 14 997	– 10	– 9
Research and development	– 9 074	– 8 972	– 1	0
Other income	1 690	1 969	– 14	– 15
Other expense	– 2 735	– 2 331	– 17	– 16
Operating income	8 169	8 629	– 5	– 5
Return on net sales (%)	15.7	17.6		
Income from associated companies	6 438	1 108	nm	nm
Interest expense	– 957	– 777	– 23	– 27
Other financial income and expense	185	39	nm	nm
Income before taxes	13 835	8 999	54	54
Taxes	– 1 221	– 1 296	6	5
Net income	12 614	7 703	64	64
Attributable to:				
Shareholders of Novartis AG	12 611	7 703	64	64
Non-controlling interests	3	0	nm	nm
Basic earnings per share (USD)	5.44	3.28	66	66
Net cash flows from operating activities	14 272	12 621	13	
Free cash flow [1]	11 717	10 428	12	

[1] For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."
nm = not meaningful

Group overview

Novartis delivered strong performance in 2018 driven by continued sales momentum from our key growth products and the successful acquisition of Advanced Accelerator Applications (AAA).

Net sales for Novartis were USD 51.9 billion, up 6% in reported terms and up 5% measured in constant currencies (cc) to remove the impact of exchange rate movements. The strong sales growth was driven by volume growth of 9 percentage points (cc), mainly driven by *Cosentyx*, AAA and four additional drugs reaching blockbuster status (*Promacta/Revolade, Tafinlar + Mekinist, Entresto* and *Xolair)*. The strong volume growth was partly offset by the negative impacts of pricing (-2 percentage points) and generic competition (-2 percentage points).

Cosentyx, our treatment for psoriasis and other autoimmune diseases, grew strongly across all indications, with sales rising 37% (+36% cc), to USD 2.8 billion. *Entresto*, our product for heart failure has now more than doubled sales reaching USD 1.0 billion.

Our treatments for certain cancer and related rare diseases continued to grow, driven by strong demand. *Promacta/Revolade*, a treatment for blood disorders, grew 35% (+35% cc) to USD 1.2 billion. *Tafinlar + Mekinist*, a combination treatment for skin and lung cancers, had sales of USD 1.2 billion, up 32% (+31% cc). *Jakavi*, a treatment for rare blood cancers, grew 26% (+24% cc) to USD 977 million. Sales of the products from AAA, including *Lutathera*, a radioligand therapy for a rare type of cancer in the pancreas or gut, amounted to USD 355 million.

By division, Innovative Medicines sales grew 8% (+8% cc). Alcon sales grew 6% (+5% cc), reflecting the second consecutive year of growth, mainly as a result of improved operations and customer relationships. Sandoz sales declined 2% (–3% cc), mainly due to lower retail generics, which was impacted by continued US industry-wide pricing pressures, partly offset by growth in Biopharmaceuticals including the continued uptake of *Rixathon* and *Erelzi* in Europe.

Operating income in 2018 was USD 8.2 billion (–5%, –5% cc), mainly due to the impacts from M&A transactions, higher restructuring and net impairment charges, and growth investments, partly offset by higher sales. Operating income margin in constant currencies decreased 1.6 percentage points; currency had a nega-

tive impact of 0.3 percentage points resulting in a net decrease of 1.9 percentage points to 15.7% of net sales.
Net income was USD 12.6 billion compared to USD 7.7 billion in the prior year, mainly benefiting from a USD 5.7 billion net gain from the divestment of our stake in the GSK consumer healthcare joint venture. Earnings per share were USD 5.44 compared to USD 3.28 in the prior year, driven by higher net income and the lower number of shares outstanding.
Free cash flow grew 12% to USD 11.7 billion compared to USD 10.4 billion in the prior year driven by higher cash flows from operating activities, which includes the receipt of a GSK sales milestone from the divested Vaccines business, partly offset by higher net investments in intangible assets.
We also present our core results, which exclude the impact of amortization, impairments, disposals, acquisitions, restructurings and other significant one-time items, to help investors understand our underlying performance.
Core operating income was USD 13.8 billion (+8%, +8% cc) driven by higher sales and gross margin, which were partly offset by growth investments, including AveXis. Core operating income margin in constant currencies increased 0.7 percentage points; currency had a negative impact of 0.3 percentage points resulting in a net increase of 0.4 percentage points to 26.6% of net sales.
Core net income was USD 11.9 billion (+5%, +5% cc), driven by growth in core operating income, which was partly offset by the discontinuation of core income from the GSK consumer healthcare joint venture from April 1, 2018.
Core earnings per share were USD 5.15 (+6%, +6% cc), driven by growth in core net income and the lower number of shares outstanding.
Net sales by segment
The following table provides an overview of net sales to third parties by segment:

(USD millions)	Year ended Dec 31, 2018	Year ended Dec 31, 2017 restated [1]	Change in USD %	Change in constant currencies %
Innovative Medicines	34 892	32 278	8	8
Sandoz	9 859	10 060	– 2	– 3
Alcon	7 149	6 771	6	5
Net sales to third parties	51 900	49 109	6	5

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.
Innovative Medicines
Following the internal reorganization announced on October 24, 2017, and January 24, 2018, that was effective January 1, 2018, we transferred our over-the-counter ophthalmic products and certain surgical diagnostic products with sales in 2017 of USD 747 million (2016: USD 731 million) from the Innovative Medicines Division to the Alcon Division. Our prescription Ophthalmic medicines business remains with the Innovative Medicines Division. In compliance with IFRS, we updated our segment reporting to reflect this transfer, both for the current and prior years, to aid comparability of year-on-year results. For details on the Innovative Medicines net sales by business franchise see also “Item 18. Financial Statement – Note 3. Segmentation of key figures 2018, 2017 and 2016.”
In addition to this, the former Immunology and Dermatology franchise was reorganized into Immunology, Hepatology and Dermatology, and certain products were transferred to Established Medicines.
Innovative Medicines Division delivered net sales of USD 34.9 billion in 2018, up 8% in reported terms and in constant currencies (cc). The Pharmaceuticals Business Unit grew 7% (cc), driven by *Cosentyx* reaching USD 2.8 billion and *Entresto* reaching USD 1.0 billion. Oncology Business Unit grew 9% (cc), driven by AAA, including *Luthathera, Promacta/Revolade* and *Tafinlar + Mekinist* both reaching USD 1.2 billion and *Jakavi* reaching USD 977 million. Volume contributed 11 percentage points to sales growth. Generic competition had a negative impact of 2 percentage points. Pricing had a negative impact of 1 percentage point.
Regionally, in the US (USD 11.9 billion, +9%), the strong performance was driven by *Cosentyx*, *Entresto*, *Promacta/Revolade* and *Lutathera*. Europe sales (USD 12.3 billion, +8% cc) were driven by *Cosentyx, Entresto* and

Jakavi. Japan sales (USD 2.4 billion, –3% cc) declined mainly due to the biennial price cut and generic competition. Emerging Growth Markets sales increased 10% (cc) to USD 8.6 billion, mainly driven by strong growth in China.
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The following table provides an overview of net sales to third parties by franchise of the Innovative Medicines Division:

(USD millions)	Year ended Dec 31, 2018	Year ended Dec 31, 2017 [1]	Change in USD %	Constant currencies change %
Total Oncology business unit	13 428	12 274	9	9
Total Pharmaceuticals business unit	21 464	20 004	7	7
Ophthalmology	4 558	4 621	– 1	– 2
Neuroscience	3 429	3 287	4	4
Immunology, Hepatology and Dermatology	3 392	2 474	37	37
Respiratory	1 767	1 617	9	8
Cardio-Metabolic	1 050	524	100	100
Established Medicines	7 268	7 481	– 3	– 3
Total Innovative Medicines	34 892	32 278	8	8

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018, and the new franchise structure of Immunology, Hepatology and Dermatology

The following table provides the top 20 Innovative Medicines Division product net sales – 2018

			US		Rest of world			Total		
Brands	Business franchise	Indication	USD m	% change USD/cc [2]	USD m	% change USD	% change cc [2]	USD m	% change USD	% change cc [2]
Gilenya	Neuroscience	Relapsing multiple sclerosis	1 765	3	1 576	7	5	3 341	5	4
Cosentyx	Immunology, Hepatology and Dermatology	Psoriasis, ankylosing spondylitis and psoriatic arthritis	1 674	31	1 163	46	44	2 837	37	36
Lucentis	Ophthalmology	Age-related macular degeneration		2	046	8	7	2 046	8	7
Tasigna	Oncology	Chronic myeloid leukemia	806	0	1 068	4	3	1 874	2	1
Sandostatin	Oncology	Carcinoid tumors and acromegaly	817	– 2	770	– 1	– 1	1 587	– 2	– 2
Gleevec/Glivec	Oncology	Chronic myeloid leukemia and GIST	440	– 30	1 121	– 15	– 16	1 561	– 20	– 20
Afinitor/Votubia	Oncology	Breast cancer/TSC	929	13	627	– 11	– 12	1 556	2	2
Galvus Group	Established Medicines	Diabetes		1	284	4	6	1 284	4	6
Promacta/Revolade	Oncology	Immune thrombocytopenic purpura	581	30	593	41	40	1 174	35	35
Tafinlar + Mekinist	Oncology	Melanoma	457	35	698	31	29	1 155	32	31
Exjade/Jadenu	Oncology	Chronic iron overload	521	1	578	6	5	1 099	4	3
Xolair [1]	Respiratory	Asthma		1	039	13	12	1 039	13	12
Entresto	Cardio-Metabolic		556	87	472	125	124	1 028	103	102

		Chronic heart failure								
Diovan Group	Established Medicines	Hypertension	84	– 3	939	8	8	1 023	7	7
Exforge Group	Established Medicines	Hypertension	19	– 32	983	5	5	1 002	4	4
Jakavi	Oncology	Myelofibrosis			977	26	24	977	26	24
Votrient	Oncology	Renal cell carcinoma	404	– 1	424	6	5	828	2	2
Ilaris	Immunology, Hepatology and Dermatology	Auto-inflammatory (CAPS, TRAPS, HIDS/MKD, FMF, SJIA, AOSD and gout)	262	34	292	42	44	554	38	39
Travoprost Group	Ophthalmology	Reduction of elevated intraocular pressure	194	– 10	323	– 13	– 13	517	– 12	– 12
Zortress/Certican	Established Medicines	Transplantation	145	12	319	12	12	464	12	12
Top 20 products total			9 654	11	17 292	10	9	26 946	10	10
Rest of portfolio			2 210	4	5 736	0	0	7 946	1	1
			11		23			34		
Total division sales			864	9	028	8	7	892	8	8

[1] Net sales reflect *Xolair* sales for all indications (e.g., including *Xolair* SAA and *Xolair* CSU, which is managed by the Immunology, Hepatology and Dermatology franchise).
[2] Constant currencies (cc) is a non-IFRS measure. For an explanation of non-IFRS measures, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

For information about the approved indications for the products described, see “Item 4. Information on the Company—Item 4.B Business overview—Innovative Medicines—Key marketed products”.

Novartis Oncology business unit

Oncology sales were USD 13.4 billion (+9% cc) driven by AAA, including Luthathera, Promacta/Revolade, Tafinlar + Mekinist and Jakavi.

Tasigna (USD 1.9 billion, +1% cc) was broadly in line with prior year across most regions.

Sandostatin (USD 1.6 billion, −2% cc) sales declined slightly, due to competitive pressure across most regions.

Gleevec/Glivec (USD 1.6 billion, −20% cc) continued to decline due to generic competition in most major markets.

Afinitor/Votubia (USD 1.6 billion, +2% cc) sales grew slightly mainly driven by the tuberous sclerosis complex (TSC) and neuroendocrine tumor (NET) indications in the US.

Promacta/Revolade (USD 1.2 billion, +35% cc) sales grew at a strong double-digit rate across all regions.

Tafinlar + Mekinist (USD 1.2 billion, +31% cc) continued strong double-digit growth due to increased demand in metastatic melanoma and NSCLC across all regions, with strong uptake in the adjuvant melanoma indication also contributing in the US and Europe.

Exjade/Jadenu (USD 1.1 billion, +3% cc) grew driven by continued uptake in Europe and Japan as well as the FCT (film-coated tablets) formulation launch in Europe.

Jakavi (USD 977 million, +24% cc) continued strong double-digit growth across all regions driven by both the myelofibrosis and polycythemia vera indications.

Votrient (USD 828 million, +2% cc) sales grew slightly driven by growth in Japan and Emerging Growth Markets partially offset by competitive pressures in the US and Europe.

Kisqali (USD 235 million, +210% cc) continues to build momentum with growth in the US and launches in several European and Emerging Growth Markets. In July 2018, the US FDA approved two new indications for *Kisqali* based on the MONALEESA 3/7 trials, also approved in Europe in December 2018.

Lutathera (USD 167 million) launch in the US is progressing well, with over 100 centers actively treating. Sales from all AAA brands (including *Lutathera* and radiopharmaceutical diagnostic products) were USD 355 million in 2018. The US FDA approved *Lutathera* in late January 2018, shortly following the acquisition of AAA. In Europe, full reimbursement for *Lutathera* has been achieved in several countries during 2018. European authorities approved *Lutathera* in late September 2017.

Kymriah sales were USD 76 million. In May, the US FDA approved *Kymriah* for a second indication – in relapsed/refractory (r/r) DLBCL. Approval of *Kymriah* was also granted by the European Commission, Health Canada and Swissmedic for the r/r pediatric and young adult ALL and r/r DLBCL indications.

Novartis Pharmaceuticals business unit

Ophthalmology

Sales in the Ophthalmology franchise were USD 4.6 billion (–2% cc), with increased sales of *Lucentis* partially offsetting the impact of generic competition for glaucoma and anti-infective portfolios mainly in the US and Europe, as well as price erosion.

Lucentis (USD 2.0 billion, +7% cc) sales delivered strong growth benefitting from the implementation of a focused global campaign and strong retina market growth.

Travoprost Group (USD 517 million, −12% cc) sales declined mainly due to generic competition in Europe and increased competition in the US.

Neuroscience

Sales in the Neuroscience franchise were USD 3.4 billion (+4% cc), mainly driven by *Gilenya*.

Gilenya (USD 3.3 billion, +4% cc) with approximately 267,000 treated patients worldwide, continued solid growth, driven by increased demand in Europe and US. *Gilenya* was approved by the FDA in May 2018 and by the European Commission in November 2018 as the first disease-modifying therapy for pediatric relapsing multiple sclerosis addressing the strong unmet clinical need of younger patients.

Aimovig received FDA approval in May 2018 and European Commission approval in July 2018 and is now available in 25 countries as the first novel treatment designed specifically for migraine prevention. *Aimovig* was successfully launched in the US and ex-US launches are now underway, including local reimbursement procedures. Additional regulatory filings are pending with other health authorities worldwide. *Aimovig* is co-commercialized with Amgen in the US, where Amgen records sales, and Novartis has exclusive commercialization rights for all territories excluding the US and Japan. More than 165,000 patients have been treated with *Aimovig* worldwide since launch.

Immunology, Hepatology and Dermatology

Sales in the Immunology, Hepatology & Dermatology franchise reached USD 3.4 billion (+37% cc), of which *Cosentyx* delivered USD 2.8 billion.

Cosentyx (USD 2.8 billion, +36% cc) delivered strong volume growth across all indications in the US and EU. In October, Novartis presented five-year data in psoriatic arthritis and ankylosing spondylitis confirming the efficacy and safety benefits of *Cosentyx*. This adds to the results of a Phase III psoriasis study reported in 2017, demonstrating that *Cosentyx* delivers high and long-lasting skin clearance in patients with moderate-to-severe plaque psoriasis, with high response rates essentially maintained from year one to year five. These scientific data are reinforcing *Cosentyx*'s unique position as a long-lasting comprehensive treatment across PsO, PsA and AS.

Ilaris (USD 554 million, +39% cc) sales were driven by strong double-digit growth across most regions driven by volume.

Respiratory

Sales in the Respiratory franchise were USD 1.8 billion (+8% cc). *Xolair* sales amounted to USD 1.0 billion and our chronic obstructive pulmonary disease (COPD) portfolio including *Onbrez Breezhaler, Seebri Breezhaler* and *Ultibro Breezhaler* achieved sales of USD 703 million (+2% cc).

Xolair (USD 1.0 billion, +12% cc) continued to grow in both indications, Severe Allergic Asthma (SAA) and in Chronic Spontaneous Urticaria (CSU, also known as CIU), a severe skin disease, driven by increasing disease

awareness. The asthma indication is managed by the Respiratory franchise which reports all *Xolair* sales.
Ultibro Breezhaler (USD 454 million, +8% cc) continued to grow driven by positive FLAME and CLAIM study results as well as the GOLD Strategy 2018 Report and further supported by the published SUNSET study results.

Cardio-Metabolic

Sales in the Cardio-Metabolic franchise were USD 1.1 billion (+100% cc).
Entresto (USD 1.0 billion, +102% cc) sales doubled year on year driven by growing adoption by physicians and strong volume in all markets (US +87%, rest of world +124% cc). New data from the landmark PIONEER-HF trial presented at AHA 2018 and published in the NEJM reconfirms the superiority of *Entresto* over enalapril as demonstrated in PARADIGM-HF.

Established Medicines

The Established Medicines franchise had sales of USD 7.3 billion (−3% cc).
Galvus Group (USD 1.3 billion, +6% cc) continues to grow driven by solid performance in Emerging Growth Markets including China.
Diovan Group (USD 1.0 billion, +7% cc) saw increased demand mainly due to the recall of generic products in many markets.
Exforge Group (USD 1.0 billion, +4% cc) saw increased sales mainly in Emerging Growth Markets.
Zortress/Certican (USD 464 million, +12% cc) sales were driven by strong double-digit growth across all regions.
Neoral/Sandimmun(e) (USD 463 million, −6% cc) declined due to generic competition and mandatory price reductions.
Voltaren/Cataflam (USD 445 million, −3% cc) declined due to generic competition.

Sandoz

Sandoz net sales in 2018 were USD 9.9 billion, down 2% in reported terms. In constant currencies, or cc, sales declined 3%, as 8 percentage points of price erosion, mainly in the US, were partially offset by volume growth of 5 percentage points. In the US, sales were USD 2.8 billion (−16%), down mainly due to continued industry-wide pricing pressure. Sales in Europe were USD 5.0 billion (+5% cc) with growth in biosimilars mainly in Germany, France, UK and Italy. Sales in Asia, Africa and Australasia were USD 1.4 billion, down 2% (cc). Sales in Canada and Latin America were USD 779 million (+8% cc). Excluding the US, net sales grew 4% (cc).

(USD millions)	Year ended Dec 31, 2018	Year ended Dec 31, 2017	Change in USD %	Constant currencies change %
Retail Generics[1]	7 880	8 409	– 6	– 7
Biopharmaceuticals	1 436	1 135	27	24
Anti-Infectives (partner label/API)	543	516	5	3
Total	9 859	10 060	– 2	– 3

[1] Of which USD 826 million (2017: USD 880 million) represents anti-infectives sold under the Sandoz name

Retail Generics

Sandoz markets active ingredients, intermediates and finished dosage forms of pharmaceuticals. The Retail Generics franchise includes products in the therapeutic areas of cardiovascular, central nervous system, dermatology, gastrointestinal and hormonal therapies, metabolism, oncology, ophthalmics, pain and respiratory, plus finished dosage forms of anti-infectives sold under the Sandoz name. Retail Generics sales in 2018 were USD 7.9 billion (–7% cc), due to the decline in the US (–22%).

Biopharmaceuticals

The Biopharmaceuticals business comprises biosimilars, contract biologics supplied to third parties, and *Glatopa*, a generic version of Copaxone®, which treats relapsing forms of multiple sclerosis and is marketed in the US. Global sales of Biopharmaceuticals grew 24% (cc) to USD 1.4 billion driven by both Europe and the US. By region, Europe continued double-digit growth driven by *Rixathon* (rituximab) and *Erelzi* (etanercept). In the US, growth was mainly driven by *Zarxio* (now the leading filgrastim in the US market).

Anti-Infectives

Sandoz sells pharmaceutical ingredients and intermediates (mainly antibiotics) to third-party customers, as well as finished dosage forms. Anti-infectives sold to third parties for sale under their own name were USD 543 million, up 3% (cc). Total Anti-Infectives sales were USD 1.4 billion (–3% cc), and included USD 826 million sales of finished dosage forms sold under the Sandoz name.

Alcon

Sales in Alcon were restated for 2017 to reflect the product transfer between the Innovative Medicines Division and Alcon Division, announced on October 24, 2017, and January 24, 2018, that was effective as of January 1, 2018. In 2017, these sales transferred from the Innovative Medicines Division to Alcon Division amounted to USD 747 million.

Alcon net sales in 2018 were USD 7.1 billion (+6%, +5% cc), compared to USD 6.8 billion in the prior year. Alcon's results reflect the second consecutive year of net sales growth mainly as a result of improved operations and customer relationships.

(USD millions)	Year ended Dec 31, 2018	Year ended Dec 31, 2017 restated [1]	Change in USD %	Constant currencies change %
Surgical				
Consumables	2 227	2 097	6	6
Implantables	1 136	1 034	10	11
Equipment/other	636	594	7	8
Total	3 999	3 725	7	7
Vision Care				
Contact lenses	1 928	1 833	5	4
Ocular health	1 222	1 213	1	1
Total	3 150	3 046	3	3
Total net sales	7 149	6 771	6	5

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.

Surgical

Surgical sales were USD 4.0 billion (+7% cc), with growth across all key product categories, driven mainly by advanced technology intraocular lenses (AT-IOLs) and consumables.

Vision Care

Vision Care sales were USD 3.2 billion (+3% cc), driven by growth in contact lenses with continued double-digit growth of *Dailies Total1*.

Operating income

The following table provides an overview of operating income by segment:

(USD millions)	Year ended Dec 31, 2018	% of net sales	Year ended Dec 31, 2017 restated [1]	% of net sales	Change in USD %	Change in constant currencies %
Innovative Medicines	7 871	22.6	7 595	23.5	4	4
Sandoz	1 332	13.5	1 368	13.6	– 3	– 2
Alcon	– 194	– 2.7	– 3	0.0	nm	nm
Corporate	– 840		– 331		– 154	– 148
Operating income	8 169	15.7	8 629	17.6	– 5	– 5

nm = not meaningful

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.

Operating income in 2018 was USD 8.2 billion (–5%, –5% cc), mainly due to the impacts from M&A transactions, higher restructuring and net impairment charges, and growth investments, partly offset by higher sales. Operating income margin in constant currencies decreased 1.6 percentage points; negative currency impact was 0.3 percentage points, resulting in a net decrease of 1.9 percentage points to 15.7% of net sales.

Core operating income key figures1

(USD millions unless indicated otherwise)	Year ended Dec 31, 2018	Year ended Dec 31, 2017	Change in USD %	Change in constant currencies %
Core gross profit	39 418	36 578	8	7
Selling, general and administration	– 16 429	– 15 000	– 10	– 9
Research and development	– 8 681	– 8 313	– 4	– 4
Other income	596	778	– 23	– 24
Other expense	– 1 081	– 1 193	9	11
Core operating income	13 823	12 850	8	8
As % of net sales	26.6	26.2		

[1] For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

The adjustments made to operating income to arrive at core operating income amounted to USD 5.7 billion (compared to USD 4.2 billion in 2017), increasing mainly due to higher restructuring and net impairment charges.

Core operating income was USD 13.8 billion (+8%, +8% cc) driven by higher sales and gross margin, partly offset by growth investments, including AveXis. Core operating income margin in constant currencies increased by 0.7 percentage points; currency had a negative impact of 0.3 percentage points, resulting in a net increase of 0.4 percentage points to 26.6% of net sales.

The following table provides an overview of core operating income by segment:

(USD millions)	Year ended Dec 31, 2018	% of net sales	Year ended Dec 31, 2017 restated [1]	% of net sales	Change in USD %	Change in constant currencies %
Innovative Medicines	11 151	32.0	10 019	31.0	11	11
Sandoz	2 002	20.3	2 080	20.7	– 4	– 3
Alcon	1 279	17.9	1 168	17.3	10	10
Corporate	– 609		– 417		– 46	– 43
Core operating income	13 823	26.6	12 850	26.2	8	8

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.

Innovative Medicines

Operating income was USD 7.9 billion (+4%, +4% cc) mainly driven by higher sales, partly offset by increased growth and launch investments, and higher restructuring charges and net impairment charges. Operating income margin in constant currencies decreased 0.8 percentage points; currency had a negative impact of 0.1 percentage points, resulting in a net decrease of 0.9 percentage points to 22.6% of net sales.

Core adjustments amounted to USD 3.3 billion, including USD 2.2 billion of amortization of intangible assets. Prior year core adjustments were USD 2.4 billion. Core adjustments increased compared to prior year mainly due to higher restructuring and net impairment charges. Core operating income was USD 11.2 billion (+11%, +11% cc) mainly driven by strong sales growth and gross margin expansion, partly offset by higher growth investments. Core operating income margin in constant currencies increased by 1.0 percentage points; currency had a negligible impact, resulting in a net increase of 1.0 percentage points to 32.0% of net sales.

Core gross margin as a percentage of net sales increased by 0.9 percentage points (cc). Core R&D expenses decreased by 0.8 percentage points (cc). Core SG&A expenses increased by 0.7 percentage points (cc) due to launch investments

and AveXis and AAA acquisitions. Core Other Income and Expense, net, was in line with prior year.

Sandoz

Operating income was USD 1.3 billion (–3%, –2% cc) mainly driven by impairment charges related to the Sandoz US dermatology business and generic US oral solids portfolio and lower sales partly offset by continued gross margin expansion and lower amortization. Operating income margin was broadly in line with prior year.

Core adjustments amounted to USD 670 million, including USD 363 million of amortization. Prior year core adjustments were USD 712 million. Core adjustments declined compared to prior year driven by net changes in legal provisions and lower amortization partially offset by impairment charges related to the Sandoz US dermatology business and generic US oral solids portfolio. Core operating income was USD 2.0 billion (–4%, –3% cc), mainly due to the sales decline, ex-US M&S investments, partially offset by continued core gross margin expansion. Core operating income margin decreased by 0.1 percentage points, currency had a negative impact

of 0.3 percentage points, resulting in a net decrease of 0.4 percentage points to 20.3% of net sales.

Core gross margin as a percentage of net sales increased by 2.4 percentage points (cc), mainly driven by productivity gains and favorable product and geographic mix. Core R&D expenses increased by 0.4 percentage points (cc). Core SG&A expenses increased by 2.2 percentage points (cc), mainly due to higher M&S investments in key ex-US markets. Core Other Income and Expense increased the margin by 0.1 percentage points (cc).

Alcon

Operating loss was USD 194 million for the full year, compared to a loss of USD 3 million in prior year, as higher sales were more than offset by the voluntary withdrawal of *CyPass* (USD 0.3 billion) and higher investments in growth drivers. Operating income margin in constant currencies decreased 2.5 percentage points; currency had a negative impact of 0.2 percentage points, resulting in a net decrease of 2.7 percentage points to negative 2.7% of net sales.

Core adjustments increased to USD 1.5 billion compared to USD 1.2 billion in the prior year, primarily due to the voluntary withdrawal of *CyPass*. Core operating income was USD 1.3 billion (+10%, +10% cc) as higher sales and improved gross margin were partly offset investments in growth drivers. Core operating income margin in constant currencies increased by 0.8 percentage points; currency had a negative impact of 0.2 percentage points, resulting in a net increase of 0.6 percentage points to 17.9% of net sales.

Core gross margin as a percentage of net sales increased by 1.4 percentage points (cc). Core R&D expenses decreased 0.2 percentage points (cc). Core SG&A expenses increased by 0.9 percentage points (cc) reflecting higher growth and operational investments. Core Other Income and Expense increased the margin by 0.1 percentage points (cc).

Corporate income and expense, net

Corporate income and expense, which includes the cost of Group management and central services, amounted to an expense of USD 840 million in 2018 compared to USD 331 million in prior year. The increase in net expense compared to prior year was mainly due to lower contributions from the Novartis Venture Fund, lower income from retained vaccines intellectual property, higher NBS restructuring costs and an income from a sales milestone in the prior year related to the Vaccines divestment.

Research and development of Innovative Medicines Division

The following table provides an overview of the reported and core research and development expense of the Innovative Medicines Division:

(USD millions unless indicated otherwise)	Year ended Dec 31, 2018	Year ended Dec 31, 2017 restated [1]	Change in USD %	Change in constant currencies %
Research and exploratory development	– 2 770	– 2 729	– 2	– 1
Confirmatory development	– 4 905	– 4 886	0	0
Total Innovative Medicines Division research and development expense	– 7 675	– 7 615	– 1	0
As % of Innovative Medicines net sales to third parties	22.0	23.6		
Core research and exploratory development[2]	– 2 665	– 2 603	– 2	– 2
Core confirmatory development[2]	– 4 675	– 4 431	– 6	– 5
Total core Innovative Medicines Division research and development expense	– 7 340	– 7 034	– 4	– 4
As % of Innovative Medicines net sales to third parties	21.0	21.8		

[1] 2017 figures are restated to reflect the product transfers between divisions that was effective as of January 1, 2018, and in addition for certain amounts that were reclassified from research and exploratory development to confirmatory development for comparative purposes.

[2] Core excludes impairments, amortization and certain other items. For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

Innovative Medicines Division research and exploratory development expense increased by 2% (–1% cc) to USD 2.8 billion in 2018, and confirmatory development expense amounted to USD 4.9 billion, broadly in line with prior year. This was mainly due to higher pipeline investments, including AveXis, which were offset by lower net impairment charges (mainly prior-year RLX030) and productivity.

Total core research and development expense in the Innovative Medicines Division as a percentage of sales decreased by 0.8 percentage points in constant currencies mainly driven by continued resource allocation and productivity efforts, and the higher net sales. The impact from currency exchange rates was negligible, yielding a net decrease of 0.8 percentage points to 21.0% of net sales.

Non-operating income and expense

The following table provides an overview of non-operating income and expense:

(USD millions unless indicated otherwise)	Year ended Dec 31, 2018	Year ended Dec 31, 2017	Change in USD %	Change in constant currencies %
Operating income	8 169	8 629	– 5	– 5
Income from associated companies	6 438	1 108	nm	nm
Interest expense	– 957	– 777	– 23	– 27
Other financial income and expense	185	39	nm	nm
Income before taxes	13 835	8 999	54	54
Taxes	– 1 221	– 1 296	6	5
Net income	12 614	7 703	64	64
Basic EPS (USD)	5.44	3.28	66	66

nm = not meaningful

Income from associated companies

Income from associated companies increased to USD 6.4 billion from USD 1.1 billion in prior year, an increase of USD 5.3 billion. This increase was mainly due to the pre-tax gain of USD 5.8 billion recognized on the divestment of the 36.5% stake in the GSK consumer healthcare joint venture. Excluding this divestment gain, income from associated companies amounted to USD 648 million compared to USD 1.1 billion in prior year.

The share of income from Roche was USD 526 million compared to USD 456 million in prior year. The higher estimated income for Roche of USD 130 million in 2018, was partly offset by the net impacts from a negative prior year adjustment of USD 125 million recognized in 2018, compared to a negative prior year adjustment of USD 67 million recognized in 2017. The share of income from the GSK consumer healthcare joint venture decreased by USD 509 million compared to prior year, due to the discontinuation of the recognition of income from April 1, 2018 (see “Item 18. Financial Statements—Note 2. Significant transactions”).

Interest expense and other financial income and expense

Interest expense was USD 957 million compared to USD 777 million in prior year, an increase of USD 180 million due to higher interest expense of USD 134 million relating to the level of outstanding debt, and higher interest expense of USD 46 million on discounting of long term liabilities.

Other financial income and expense amounted to an income of USD 185 million compared to an income of USD 39 million in prior year, mainly due to higher interest income of USD 294 million compared to USD 110 million in prior year, partly offset by higher currency losses of USD 65 million compared to currency losses of USD 58 million in prior year and higher other financial expenses, net of USD 44 million compared to USD 13 million in prior year.

Taxes

The tax rate in 2018 was 8.8% compared to 14.4% in prior year, due to the impact on taxes of the divestment of the 36.5% stake in the GSK consumer healthcare joint venture. Excluding the impact of the divestment, the tax rate in 2018 would have been 14.4% in line with the 14.4% in prior year, as the benefit from favorable profit mix was offset by the impact from the discontinuation of the recognition of the income from associated companies related to the GSK consumer healthcare joint venture from April 1, 2018 (see “Item 18. Financial Statements—Note 2. Significant transactions”).

Net income

Net income was USD 12.6 billion, compared to USD 7.7 billion in prior year, mainly benefiting from a USD 5.7 billion net gain from the divestment of our stake in the GSK consumer healthcare joint venture, in the second quarter of 2018.

EPS

Basic earnings per share (EPS) in 2018 was USD 5.44, compared to USD 3.28 in the prior year, driven by higher net income and lower number of shares outstanding.

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Core non-operating income and expense[1]

The following table provides an overview of core non-operating income and expense:

(USD millions unless indicated otherwise)	Year ended Dec 31, 2018	Year ended Dec 31, 2017	Change in USD %	Change in constant currencies %
Core operating income	13 823	12 850	8	8
Core income from associated companies	1 113	1 335	– 17	– 17
Core interest expense	– 957	– 777	– 23	– 27
Core other financial income and expense	185	39	nm	nm
Core income before taxes	14 164	13 447	5	5
Core taxes	– 2 226	– 2 056	– 8	– 8
Core net income	11 938	11 391	5	5
Core basic EPS (USD)	5.15	4.86	6	6

[1] For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

nm = not meaningful

Core income from associated companies

Core income from associated companies amounted to USD 1.1 billion compared to USD 1.3 billion in prior year. The core income contribution from Roche amounted to USD 970 million compared to USD 832 million in prior year, an increase of USD 138 million, mainly due to the higher estimated contribution from core income. The share of core income from GSK consumer healthcare joint venture decreased by USD 338 million compared to prior year, due to the discontinuation of core income from April 1, 2018 (see “Item 18. Financial Statements—Note 2. Significant transactions”).

Core interest expense and other financial income and expense

Core interest expense was USD 957 million compared to USD 777 million in prior year. Core other financial income and expense amounted to a net income of USD 185 million, compared to USD 39 million in 2017.

Core taxes

The core tax rate (core taxes as a percentage of core pre-tax income) increased to 15.7% from 15.3% in the prior year.

Core net income

Core net income was USD 11.9 billion (+5%, +5% cc) driven by growth in core operating income, partly offset by the discontinuation of core income from the GSK consumer healthcare joint venture from April 1, 2018.

Core EPS

Core earnings per share were USD 5.15 (+6%, +6% cc), driven by growth in core net income and the lower number of shares outstanding.

2017 compared to 2016
Key figures

(USD millions unless indicated otherwise)	Year ended Dec 31, 2017	Year ended Dec 31, 2016	Change in USD %	Change in constant currencies %
Net sales to third parties	49 109	48 518	1	2
Other revenues	1 026	918	12	11
Cost of goods sold	– 17 175	– 17 520	2	2
Gross profit	32 960	31 916	3	4
Selling, general and administration	– 14 997	– 14 192	– 6	– 7
Research and development	– 8 972	– 9 039	1	1
Other income	1 969	1 927	2	1
Other expense	– 2 331	– 2 344	1	0
Operating income	8 629	8 268	4	7
Return on net sales (%)	17.6	17.0		
Income from associated companies	1 108	703	58	58
Interest expense	– 777	– 707	– 10	– 12
Other financial income and expense	39	– 447	nm	nm
Income before taxes	8 999	7 817	15	12
Taxes	– 1 296	– 1 119	– 16	– 13
Net income	7 703	6 698	15	12
Attributable to:				
Shareholders of Novartis AG	7 703	6 712	15	12
Non-controlling interests	0	– 14	nm	nm
Basic earnings per share (USD)	3.28	2.82	16	14
Net cash flows from operating activities	12 621	11 475	10	
Free cash flow [1]	10 428	9 455	10	

[1] For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."
nm = not meaningful
Group overview
Novartis had solid performance in 2017, as strong sales of our growth drivers – including *Cosentyx* (secukinumab), *Entresto* (sacubitril/valsartan) and other recently launched products – continued to offset the impact of generic competition for our cancer treatment *Gleevec/Glivec*, which lost patent protection in the US and Europe during 2016. Our results underscore the breadth and strength of our product portfolio and highlight our success at steering through the patent expiration of one of our biggest selling drugs.
Our divisions had varied results. Sales increased in the Innovative Medicines Division, and the Alcon eye care division returned to growth in 2017. Sandoz Division sales declined, as the effects of increased price competition in the US more than offset growth in the rest of the world.
Net sales in 2017 for Novartis were USD 49.1 billion, up 1% in reported terms and up 2% measured in constant currencies (cc) to remove the impact of exchange rate movements. Sales volumes increased 7%, as growth drivers – such as *Cosentyx* (USD 2.1 billion; +84%, +82% cc), *Entresto* (USD 507 million; +198%, +195% cc), *Promacta/Revolade* (USD 867 million; +37%, +37% cc), and *Tafinlar + Mekinist* (USD 873 million; +30%, +29% cc) – more than offset the impact of patent expirations for *Gleevec/Glivec* (USD 1.9 billion; –42%, –41% cc).
The impact of currency exchange headwinds eased in 2017 compared to what we have seen for several years, particularly in 2015 when currency fluctuations had a negative 10% impact on sales. To help investors assess the impact of exchange rates on our performance, we continue to also indicate growth rates in constant currencies.

Operating income in 2017 was USD 8.6 billion (+4%, +7% cc), mainly driven by higher sales, productivity improvements and lower amortization, which were partly offset by generic competition and higher marketing investments to support product launches.

Net income in 2017 was USD 7.7 billion (+15%, +12% cc), benefiting from growth in operating income and higher income from our stake in GSK Consumer Healthcare Holdings Ltd.

Basic earnings per share were USD 3.28 (+16%, +14% cc), benefiting from higher net income and our share buyback program.

Free cash flow rose 10% to USD 10.4 billion, driven mainly by improved cash flow from operating activities.

Net sales by segment

The following table provides an overview of net sales to third parties by segment:

(USD millions)	Year ended Dec 31, 2017 restated [1]	Year ended Dec 31, 2016 restated [1]	Change in USD %	Change in constant currencies %
Innovative Medicines	32 278	31 831	1	2
Sandoz	10 060	10 144	– 1	– 2
Alcon	6 771	6 543	3	4
Net sales to third parties	49 109	48 518	1	2

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.

Innovative Medicines

Following changes to the divisional structure of Novartis effective January 1, 2018, the sales and results of Innovative Medicines in 2017 and 2016 were restated and exclude the sales of the over-the-counter ophthalmic products and certain surgical diagnostic products, which were transferred to the Alcon Division. In 2017, these sales amounted to USD 747 million, and in 2016, they amounted to USD 731 million. In both years, they were reported under the Ophthalmology franchise.

In addition to this, the former Immunology and Dermatology franchise was reorganized into Immunology, Hepatology and Dermatology, and certain products were transferred to Established Medicines. For details on the Innovative Medicines net sales by business franchise, see also “Item 18. Financial Statements—Note 3. Segmentation of key figures 2018, 2017 and 2016.”

Innovative Medicines Division sales in 2017 were USD 32.3 billion, up 1% in reported terms. In constant currencies (cc), sales grew 2%. An 8% increase in volume more than offset the impact of generic competition (−5 percentage points) and price declines (−1 percentage point). Products contributing to sales growth included *Cosentyx, Entresto, Promacta/Revolade, Tafinlar + Mekinist,* and *Jakavi.*

Regionally, sales performance was mixed. In the US, sales rose 2% to USD 10.9 billion, overcoming the impact of generic competition, mainly for *Gleevec*. Sales in Europe were USD 11.1 billion, up 1% in reported terms and in line with the prior year in constant currencies, as growth drivers offset the impact of patent loss for *Gleevec/Glivec*. Sales rose 3% (+7% cc) in Emerging Growth Markets to USD 8.1 billion. Sales in Japan were USD 2.4 billion, a decline of 4% in reported terms and in line with the prior year in constant currencies.

The following table provides an overview of net sales to third parties by franchise of the Innovative Medicines Division:

(USD millions)	Year ended Dec 31, 2017 [1]	Year ended Dec 31, 2016 [1]	Change in USD %	Constant currencies change %
Total Oncology business unit	12 274	12 790	– 4	– 3
Total Pharmaceutical business unit	20 004	19 041	5	6
Ophthalmology	4 621	4 733	– 2	– 2
Neuroscience	3 287	3 233	2	2
Immunology, Hepatology and Dermatology	2 474	1 412	75	74
Respiratory	1 617	1 521	6	8
Cardio-Metabolic	524	184	185	182
Established Medicines	7 481	7 958	– 6	– 4
Total Innovative Medicines	32 278	31 831	1	2

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018, and the new franchise structure of Immunology, Hepatology and Dermatology

The following table provides the Top 20 Innovative Medicines Division product net sales—2017

			US		Rest of world			Total		
Brands	Business franchise	Indication	USD m	% change USD/cc [3]	USD m	% change USD	% change cc [3]	USD m	% change USD	% change cc [3]
Gilenya	Neuroscience	Relapsing multiple sclerosis	1 709	2	1 476	4	3	3 185	2	2
Cosentyx	Immunology, Hepatology and Dermatology	Psoriasis, ankylosing spondylitis and psoriatic arthritis	1 275	67	796	119	115	2 071	84	82
Gleevec/Glivec	Oncology	Chronic myeloid leukemia and GIST	627	– 48	1 316	– 38	– 37	1 943	– 42	– 41
Lucentis	Ophthalmology	Age-related macular degeneration			1 888	3	4	1 888	3	4
Tasigna	Oncology	Chronic myeloid leukemia	810	12	1 031	1	6	1 841	6	9
Sandostatin	Oncology	Carcinoid tumors and acromegaly	832	– 2	780	– 2	1	1 612	– 2	– 1
Afinitor/Votubia	Oncology	Breast cancer/TSC	819	6	706	– 5	– 3	1 525	1	2
Galvus Group	Cardio-Metabolic	Diabetes			1 233	3	5	1 233	3	5
Exjade/Jadenu	Oncology	Chronic iron overload	515	15	544	7	8	1 059	11	11
Exforge Group	Established Medicines	Hypertension	28	180	932	2	2	960	4	4
Diovan Group	Established Medicines	Hypertension	87	– 41	870	– 6	– 4	957	– 11	– 9
Xolair [1]	Respiratory	Asthma			920	10	11	920	10	11
Tafinlar + Mekinist	Oncology	Melanoma	339	14	534	43	41	873	30	29
Promacta/Revolade	Oncology	Immune thrombocytopenic purpura	446	44	421	30	31	867	37	37
Votrient	Oncology	Renal cell carcinoma	407	14	401	8	7	808	11	10
Jakavi	Oncology	Myelofibrosis			777	34	32	777	34	32
Travoprost Group	Ophthalmology	Reduction of elevated intraocular pressure	216	2	373	– 9	– 9	589	– 5	– 5
Entresto	Cardio-Metabolic	Chronic heart failure	297	161	210	275	262	507	198	195
Neoral/Sandimmun(e)	Immunology, Hepatology and Dermatology	Transplantation	38	– 7	450	– 5	– 4	488	– 5	– 4
Voltaren/Cataflam	Established Medicines	Inflammation/pain			465	– 11	– 4	465	– 11	– 4
Top 20 products total			8 445	6	16 123	2	3	24 568	4	4

Rest of portfolio[2]	2 412	– 11	5 298	– 2	0	7 710	– 5	– 4
Total division sales[2]	10 857	2	21 421	1	2	32 278	1	2

[1] Net sales reflect *Xolair* sales for all indications (e.g. including *Xolair* SAA and *Xolair* CSU, which are managed by the Immunology, Hepatology and Dermatology franchise).

[2] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018

[3] Constant currencies (cc) is a non-IFRS measure. For an explanation of non-IFRS measures, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

For information about the approved indications for the products described below, see “Item 4. Information on the Company—Item 4.B Business overview—Innovative Medicines—Key marketed products.”

Novartis Oncology business unit

Oncology sales in 2017 were USD 12.3 billion (−3% cc), as strong performance of existing products and the launch of new products, including *Kisqali, Rydapt* and *Kymriah*, helped to partially offset the effects of generic competition on *Gleevec/Glivec*. Significant gains on key hematology products, such as *Tasigna*, *Promacta/Revolade* and *Jakavi*, were complemented by *Tafinlar + Mekinist*, which was approved for advanced non-small cell lung cancer in addition to the existing use in melanoma.

Gleevec/Glivec (USD 1.9 billion, −41% cc) continued to decline this year, driven by generic competition primarily across Europe and the US.

Tasigna (USD 1.8 billion, +9% cc) continued to grow this year, primarily in the US and Emerging Growth Markets, despite some impact of generic imatinib in Europe for patients with previously untreated Philadelphia chromosome-positive (Ph+) chronic myeloid leukemia.

Sandostatin (USD 1.6 billion, −1% cc) declined slightly this year, driven by increased competitive pressure primarily in the US and Japan, which was partially offset by growth in Latin America and Emerging Growth Markets.

Afinitor/Votubia (USD 1.5 billion, +2% cc) grew slightly this year as the neuroendocrine tumors and tuberous sclerosis complex indications compensated for competitive pressure in the breast cancer and renal cell carcinoma indications.

Exjade/Jadenu (USD 1.1 billion, +11% cc) sales growth was primarily driven by solid growth in the US in addition to continued uptake of the film-coated tablet formulation in Europe.

Tafinlar + Mekinist (USD 873 million, +29% cc) sales growth was primarily driven by combination uptake across Europe in addition to launch uptake in the US for the non-small cell lung cancer indication.
Promacta/Revolade (USD 867 million, +37% cc) continued to deliver solid double-digit growth across all regions.
Votrient (USD 808 million, +10% cc) worldwide growth was driven primarily by the advanced renal cell carcinoma indication both in the US and in Emerging Growth Markets, specifically China and Asia-Pacific countries.
Jakavi (USD 777 million, +32% cc) delivered strong double-digit growth across all regions, driven by continued momentum in the myelofibrosis indication in addition to reimbursement and launch uptake in the polycythemia vera indication across Europe.

Novartis Pharmaceuticals business unit

Ophthalmology

Sales in the Ophthalmology franchise were restated for 2017 and 2016 to reflect the product transfers between the Innovative Medicines and Alcon Divisions, announced on October 24, 2017, and January 24, 2018, that was effective January 1, 2018.
Total sales for 2017 amounted to USD 4.6 billion (–2% cc), with increased sales of *Lucentis* helping to partially offset the impact of generic competition.
Lucentis (USD 1.9 billion, +4% cc) sales continued to grow, driven by market expansion in Europe, Japan and Emerging Growth Markets, and reimbursement listing in China for neovascular age-related macular degeneration.
Travoprost Group (USD 589 million, –5% cc) sales declined mainly due to loss of exclusivity in Europe.

Neuroscience

Neuroscience franchise sales in 2017 were USD 3.3 billion (+2% cc), driven by increased sales for *Gilenya* (USD 3.2 billion, +2% cc) which continued to grow across regions, mainly driven by volume.

Immunology, Hepatology and Dermatology

Sales in 2017 in the Immunology, Hepatology and Dermatology franchise reached USD 2.5 billion (+74% cc).
Cosentyx saw continued strong growth across all indications, particularly in the US and Europe, reaching USD 2.1 billion (+82% cc). *Ilaris* also continued to deliver strong gains (+42% cc).

Respiratory

Respiratory franchise sales in 2017 were USD 1.6 billion (+8% cc). Our chronic obstructive pulmonary disease (COPD) portfolio – including *Onbrez Breezhaler*, *Seebri Breezhaler* and *Ultibro Breezhaler*– achieved sales of USD 674 million (+5% cc). Sales of *Xolair*, for moderate-to-severe or severe, persistent asthma, as well as for chronic hives, reached USD 920 million (+11% cc) and showed balanced growth across all regions.

Cardio-Metabolic

Sales for the franchise in 2017 were USD 524 million (+182% cc). *Entresto*– which has been launched in nearly 60 countries and used to treat more than 420 000 heart failure patients worldwide – continued to grow, and sales reached USD 507 million (+195% cc). *Entresto* performance was driven by growing adoption by physicians in the US and EU, and continued market access improvement.

Established Medicines

The Established Medicines franchise had sales in 2017 of USD 7.5 billion (–4% cc). Increased sales of *Galvus* Group and *Exforge* Group were more than offset by declines for products such as *Diovan* Group, *Neoral/Sandimmun(e)* and *Exelon/Exelon* Patch (–14% cc) due to generic competition.
Galvus Group (USD 1.2 billion, +5% cc) continued to grow, driven by solid performance in Japan and Emerging Growth Markets.
Exforge Group (USD 960 million, +4% cc) grew despite ongoing generic competition in the US and Japan, and new generic competition in Europe in 2017. Growth was driven by Emerging Growth Markets.
Diovan Group (USD 957 million, –9% cc) saw sales decline due to loss of exclusivity including in the US, EU and Japan, while sales continued to grow in China and some Emerging Growth Markets.
Neoral/Sandimmun(e) (USD 488 million, –4% cc) sales declined slightly due to generic competition and mandatory price reductions, mainly in Europe and Japan.
Voltaren/Cataflam (USD 465 million, –4% cc) sales were impacted by increased generic competition.

Sandoz

Sandoz net sales in 2017 were USD 10.1 billion, down 1% in reported terms. In constant currencies, or cc, sales declined 2%. A 6 percentage-point increase in volume was more than offset by the negative 8 percentage-point effect

of price erosion. Sales rose +4% (cc) in Europe to USD 4.6 billion. In the US, where we continue to see customer consolidation and greater competition, sales were USD 3.3 billion (−12%), mainly due to increased industrywide pressure on prices in generics. Sales in Asia, Africa and Australasia were USD 1.4 billion, up 1% in constant currencies.

(USD millions)	Year ended Dec 31, 2017	Year ended Dec 31, 2016	Change in USD %	Constant currencies change %
Retail Generics[1]	8 409	8 623	– 2	– 3
Biopharmaceuticals	1 135	1 002	13	12
Anti-Infectives (partner label/API)	516	519	– 1	– 2
Total	10 060	10 144	– 1	– 2

[1] Of which USD 880 million (2016: USD 860 million) represents Anti-infectives sold under Sandoz name

Retail Generics

Sandoz markets active ingredients, intermediates, and finished dosage forms of pharmaceuticals. The Retail Generics franchise includes products in the therapeutic areas of cardiovascular, central nervous system, dermatology, gastrointestinal and hormonal therapies, metabolism, oncology, ophthalmics, pain and respiratory, plus finished dosage forms of anti-infectives sold under the Sandoz name. Franchise sales in 2017 were USD 8.4 billion, down 3% (cc). Declines in the US (−14%) more than offset increased sales in the rest of the world (+3% cc).

Biopharmaceuticals

The Biopharmaceuticals business comprises biosimilars; contract biologics supplied to third parties; and a generic version of Copaxone® 20 mg, *Glatopa*, which treats relapsing forms of multiple sclerosis and is marketed in the US. Global sales in 2017 of Biopharmaceuticals grew 12% (cc) to USD 1.1 billion, driven by *Zarxio* (filgrastim), *Binocrit* (epoetin alfa), and the launch of *Rixathon* (rituximab) and *Erelzi* (etanercept) in several European countries.

Anti-Infectives

Sandoz sells pharmaceutical ingredients and intermediates (mainly antibiotics) to third-party customers, as well as finished dosage forms. Anti-infectives sold to third parties for sale under their own name were USD 516 million, down 2% (cc) due to the discontinuation of some low-margin products. Total Anti-Infectives sales in 2017 were USD 1.4 billion, in line with the prior year in constant currencies, and included sales of finished dosage forms sold under the Sandoz name of USD 880 million, up 2% (cc).

Alcon

Sales in Alcon were restated for 2017 and 2018 to reflect the product transfer between the Innovative Medicines Division and Alcon Division, announced on October 24, 2017, and January 24, 2018, that was effective as of January 1, 2018. In 2017, these sales transferred from the Innovative Medicines Division to Alcon Division amounted to USD 747 million and in 2016 USD 731 million.

Alcon continued to implement its growth plan in 2017, with a focus on strengthening customer relationships, improving operations, and accelerating innovation and sales. In the US, Alcon launched the *AcrySof* IQ *ReSTOR* +2.5 D Multifocal Toric intraocular lens (IOL) with ACTIVEFOCUS optical design, which aims to improve distance vision in cataract patients with astigmatism. Other product launches in 2017 include the *CyPass* Micro-Stent in the EU to treat glaucoma. Alcon also received European approval for the *Clareon* IOL with *AutonoMe* pre-loaded delivery system, the first and only automated, disposable IOL delivery system for cataract surgery.

(USD millions)	Year ended Dec 31, 2017 restated [1]	Year ended Dec 31, 2016 restated [1]	Change in USD %	Constant currencies change %
Surgical				
Consumables	2 097	2 007	4	5
Implantables	1 034	1 007	3	4
Equipment/other	594	565	5	5
Total	3 725	3 579	4	5
Vision Care				
Contact lenses	1 833	1 762	4	4
Ocular health	1 213	1 202	1	0
Total	3 046	2 964	3	2
Total net sales	6 771	6 543	3	4

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.

Surgical

Surgical sales in 2017 grew 5% (cc) to USD 3.7 billion, mainly driven by the by the consumables portfolio (+5% cc), particularly for cataract and vitreoretinal surgery. Implantables grew 4% (cc) as strong performance of new products,

including the UltraSert pre-loaded IOL delivery system, the *AcrySof* IQ *PanOptix* trifocal IOL and *AcrySof* IT *ReSTOR* +2.5D Toric IOL , was partly offset by declines in monofocal IOLs which continued to face competitive pressures. Sales of equipment grew 5% (cc), mainly driven by sales of vitreoretinal equipment.

Vision Care

Vision Care sales in 2017 grew 2% (cc) to USD 3.0 billion driven by contact lens sales (+4% cc). Contact lens sales growth was driven by continued double-digit growth of *Dailies Total1*, the world's first and only water gradient lens, and was partly offset by declines in reusable lenses as the market continues to shift to daily disposable lenses. Ocular health sales remained broadly in line with the prior year (0% cc), as dry eye growth was offset by a decline in contact lens care product sales impacted by the continued market shift to daily disposable lenses.

Operating income

The following table provides an overview of operating income by segment:

(USD millions)	Year ended Dec 31, 2017 restated [1]	% of net sales	Year ended Dec 31, 2016 restated [1]	% of net sales	Change in USD %	Change in constant currencies %
Innovative Medicines	7 595	23.5	7 255	22.8	5	7
Sandoz	1 368	13.6	1 445	14.2	– 5	– 7
Alcon	– 3	0.0	39	0.6	nm	nm
Corporate	– 331		– 471		30	27
Operating income	8 629	17.6	8 268	17.0	4	7

nm = not meaningful

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.

Operating income in 2017 was USD 8.6 billion (+4%, +7% cc), as growth drivers, productivity, lower amortization, and a gain from the achievement of a sales milestone related to the 2015 Vaccines divestment to GSK more than offset generic erosion. Operating income margin in constant currencies increased 0.8 percentage points compared to the prior year; currency had a negative impact of 0.2 percentage points, resulting in an increase of 0.6 percentage points to 17.6% of net sales.

Core operating income key figures1

(USD millions unless indicated otherwise)	Year ended Dec 31, 2017	Year ended Dec 31, 2016	Change in USD %	Change in constant currencies %
Core gross profit	36 578	35 806	2	3
Selling, general and administration	– 15 000	– 14 111	– 6	– 6
Research and development	– 8 313	– 8 402	1	1
Other income	778	753	3	2
Other expense	– 1 193	– 1 059	– 13	– 13
Core operating income	12 850	12 987	– 1	0
As % of net sales	26.2	26.8		

[1] For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

The adjustments made to operating income to arrive at core operating income in 2017 amounted to USD 4.2 billion (2016: USD 4.7 billion), less than in the prior year due to lower amortization and a gain from the achievement of a sales milestone related to the 2015 Vaccines divestment to GSK.

Core operating income in 2017 was USD 12.9 billion (−1%, 0% cc). Core operating income margin in constant currencies decreased 0.3 percentage points, mainly due to generic competition for *Gleevec/Glivec*, and higher launch investments, which were partially offset by expanded gross margin and productivity improvements. Currency exchange rates had an additional negative impact of 0.3 percentage points, yielding a net decrease of 0.6 percentage points to 26.2% of net sales.

The following table provides an overview of core operating income by segment:

(USD millions)	Year ended	% of	Year ended	% of	Change in USD	Change in constant currencies

	Dec 31, 2017 restated [1]	net sales	Dec 31, 2016 restated [1]	net sales	%	%
Innovative Medicines	10 019	31.0	10 054	31.6	0	2
Sandoz	2 080	20.7	2 071	20.4	0	– 1
Alcon	1 168	17.3	1 150	17.6	2	5
Corporate	– 417		– 288		– 45	– 53
Core operating income	12 850	26.2	12 987	26.8	– 1	0

[1] Restated to reflect the product transfers between divisions that was effective as of January 1, 2018.

Innovative Medicines

Operating income in 2017 was USD 7.6 billion (+5%, +7% cc), mainly driven by higher sales, productivity improvements and lower amortization, which offset the impact of generic competition and investments in growth drivers.

Core operating income, which excludes certain items, in 2017 was USD 10.0 billion (0%, +2% cc). Core operating income margin decreased 0.2 percentage points in constant currencies, and fluctuations in exchange rates had a further negative impact of 0.4 percentage points, resulting in a net decrease of 0.6 percentage points to 31.0% of net sales.

Sandoz

Operating income in 2017 was USD 1.4 billion (−5%, −7% cc), down mainly due to pressure on prices in the US, investments in marketing and sales in key markets outside the US, and higher manufacturing restructuring charges. These negative impacts were partly offset by favorable changes in product mix.

Core operating income, which excludes certain items, in 2017 was USD 2.1 billion (0%, −1% cc). Core operating income margin in constant currencies increased 0.1 percentage points, and an additional 0.2 percentage point increase from exchange rates yielded a result of 20.7% of net sales.

Alcon

Operating loss in 2017 was USD 3 million, compared to an operating income of USD 39 million the year before, as higher sales were offset by continued investment in the division's growth plan and charges related to business development activities.

Core operating income, which excludes certain items, in 2017 was USD 1.2 billion (+2%, +5% cc). Core operating income margin in constant currencies increased by 0.2 percentage points, offset by negative currency impact of 0.5 percentage points, yielding a net decrease of 0.3 percentage points to 17.3% of net sales.

Corporate income and expense, net

Corporate income and expense, which includes the cost of Group management and central services, amounted to a net expense of USD 331 million (+30%, +27% cc) in 2017, compared to a net expense of USD 471 million in the prior year. The favorable decrease in expense was mainly due to a gain from the achievement of a sales milestone related to the 2015 Vaccines divestment to GSK, partly offset by lower gains from divestment in real estate and lower contributions from the captive insurance companies.

Research and development of Innovative Medicines Division

The following table provides an overview of the reported and core research and development expense of the Innovative Medicines Division:

(USD millions unless indicated otherwise)	Year ended Dec 31, 2017 restated [1]	Year ended Dec 31, 2016 restated [1]	Change in USD %	Change in constant currencies %
Research and exploratory development	– 2 729	– 2 720	0	0
Confirmatory development	– 4 886	– 4 976	2	2
Total Innovative Medicines Division research and development expense	– 7 615	– 7 696	1	1
As % of Innovative Medicines net sales to third parties	23.6	24.2		
Core research and exploratory development[2]	– 2 603	– 2 618	1	1
Core confirmatory development[2]	– 4 431	– 4 482	1	1
Total core Innovative Medicines Division research and development expense	– 7 034	– 7 100	1	1
As % of Innovative Medicines net sales to third parties	21.8	22.3		

[1] 2017 and 2016 figures are restated to reflect the product transfers between divisions that was effective as of January 1, 2018, and in addition for certain amounts that were reclassified from research and exploratory development to confirmatory development for comparative purposes.

[2] Core excludes impairments, amortization and certain other items. For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

Innovative Medicines Division research and exploratory development expense amounted to USD 2.7 billion in 2017, in line with the prior year. Confirmatory development expense decreased by 2% (+2% cc) to USD 4.9 billion, compared to USD 5.0 billion in 2016, driven by resource allocation and continued productivity efforts, including the benefit of the creation of the Novartis Global Drug Development (GDD) organization.

Total core research and development expense in the Innovative Medicines Division as a percentage of sales decreased by 0.7 percentage points in constant currencies, mainly due to resource allocation and continued productivity efforts. Currency exchange rates had a negative impact of 0.2 percentage points, yielding a net decrease of 0.5 percentage points to 21.8% of net sales.

Non-operating income and expense

The following table provides an overview of non-operating income and expense:

(USD millions unless indicated otherwise)	Year ended Dec 31, 2017	Year ended Dec 31, 2016	Change in USD %	Change in constant currencies %
Operating income	8 629	8 268	4	7
Income from associated companies	1 108	703	58	58
Interest expense	– 777	– 707	– 10	– 12
Other financial income and expense	39	– 447	nm	nm
Income before taxes	8 999	7 817	15	12
Taxes	– 1 296	– 1 119	– 16	– 13
Net income	7 703	6 698	15	12
Total basic EPS (USD)	3.28	2.82	16	14

nm = not meaningful

Income from associated companies

Income from associated companies in 2017 increased to USD 1.1 billion, compared to USD 703 million in the prior year. The increase was due to higher income recognized from our investment in GSK Consumer Healthcare Holdings Ltd. (GSK Consumer Healthcare).

The estimated income from our investment in GSK Consumer Healthcare in 2017 amounted to USD 629 million, compared to USD 234 million in 2016. The increase is due to improved operational results of USD 89 million; an estimate of a one-time deferred tax income of USD 237 million, arising from a change in a Swiss cantonal statutory tax rate; and a positive prior-year adjustment of USD 47 million based on the actual audited results for 2016, compared to a negative prior-year adjustment of USD 22 million recognized in 2016 for 2015.

The estimated income from our investment in Roche in 2017 amounted to USD 456 million (2016: USD 464 million). This reflected our estimated share of income for 2017 of USD 523 million (2016: USD 532 million), offset by the negative prior-year adjustment of USD 67 million, based on actual 2016 results (2016: negative prior-year adjustment of USD 68 million, based on actual 2015 results).

Interest expense and other financial income and expense

Interest expense in 2017 increased to USD 777 million from USD 707 million in the prior year due to higher outstanding debt.

Other financial income and expense amounted to an income of USD 39 million, compared to an expense of USD 447 million in the prior year, mainly on account of exceptional charges related to Venezuela of USD 305 million in 2016, as well as higher currency losses in 2016.

Taxes

The tax rate in 2017 increased to 14.4% from 14.3% in the prior year. On December 22, 2017, the US enacted tax reform legislation (Tax Cuts and Jobs Act), which – among other provisions – reduced the US corporate tax rate from 35% to 21%, effective January 1, 2018. This required a revaluation of the deferred tax assets and liabilities, and a portion of current tax payables to the newly enacted tax rate at the date of enactment, which resulted in a net tax expense of USD 61 million (0.7%). In addition, a change in a Swiss cantonal statutory tax rate resulted in a one-time income from our share in GSK Consumer Healthcare, the impact of which decreased the tax rate by 0.4%. Excluding the impact of these rate changes, the reported tax rate for 2017 would have been 14.1%, compared to 14.3% in the prior year.

Net income

Net income in 2017 was USD 7.7 billion (+15%, +12% cc), benefiting from growth in operating income and higher income from our stake in GSK Consumer Healthcare Holdings Ltd. The prior year also included the exceptional charges related to Venezuela.

EPS

Basic earnings per share in 2017 were USD 3.28 (+16%, +14% cc), up more than net income in constant currencies, benefiting from our share buyback program.

Core non-operating income and expense1

The following table provides an overview of core non-operating income and expense:

(USD millions unless indicated otherwise)	Year ended Dec 31, 2017	Year ended Dec 31, 2016	Change in USD %	Change in constant currencies %
Core operating income	12 850	12 987	– 1	0
Core income from associated companies	1 335	1 134	18	18
Core interest expense	– 777	– 707	– 10	– 12
Core other financial income and expense	39	– 99	nm	nm
Core income before taxes	13 447	13 315	1	2
Core taxes	– 2 056	– 2 001	– 3	– 4
Core net income	11 391	11 314	1	2
Core basic EPS (USD)	4.86	4.75	2	3

[1] For an explanation of non-IFRS measures and reconciliation tables, see " —Item 5.A Operating results—Non-IFRS measures as defined by Novartis."

nm = not meaningful

Core income from associated companies

Core income from associated companies in 2017 increased to USD 1.3 billion from USD 1.1 billion in the prior-year period. The core income contribution from GSK Consumer Healthcare Holdings Ltd. increased to USD 479 million in 2017 from USD 369 million in the prior-year period, and the core income contribution from Roche increased to USD 832 million from USD 760 million.

Core interest expense and other financial income and expense

Core other financial income and expense in 2017 amounted to an income, net of USD 39 million, compared to an expense, net of USD 99 million in 2016, mainly on account of lower currency losses. In the prior year, the exceptional charges of USD 0.3 billion related to Venezuela were excluded from the 2016 core other financial expense.

Core taxes

The core tax rate in 2017 (core taxes as a percentage of core pre-tax income) increased to 15.3% from 15.0% in the prior year.

Core net income

Core net income in 2017 was USD 11.4 billion (+1%, +2% cc), benefiting from higher core income from associated companies.

Core EPS

Core earnings per share in 2017 were USD 4.86 (+2%, +3% cc), reflecting the benefit of our share buyback program.

Factors affecting comparability of year-on-year results of operations

Significant transactions in 2018, 2017, 2016 and significant pending transactions

The comparability of the year-on-year results of our operations for the total Group can be significantly affected by acquisitions and divestments. As part of the long-term strategy to focus Novartis as a leading medicines company, we announced and/or completed several acquisitions and divestments during 2018, 2017 and 2016.

A detailed description of the significant transactions of 2018, 2017, 2016 and significant pending transactions can be found in “Item 4.A History and development of Novartis – Important Corporate developments 2016 – 2018”, and “Item 18. Financial Statements—Note 2 Significant transactions”.

Critical accounting policies and estimates

Our significant accounting policies are set out in "Item 18. Financial Statements—Note 1. Significant accounting policies," which are prepared in accordance with International Financial Reporting Standards (IFRS) as issued by the International Accounting Standards Board (IASB).

Given the uncertainties inherent in our business activities, we must make certain estimates and assumptions that require difficult, subjective and complex judgments. Because of uncertainties inherent in such judgments, actual outcomes and results may differ from our assumptions and estimates, which could materially affect the Group's consolidated financial statements. Application of the following accounting policies requires certain assumptions and estimates that have the potential for the most significant impact on our consolidated financial statements.

New accounting pronouncements

Novartis implemented IFRS 9 Financial Instruments as of January 1, 2018, which substantially changes the classification and measurement of financial instruments. The new standard requires impairments to be based on a forward-looking model, changes the approach to hedging financial exposures and related documentation, changes the recognition of certain fair value changes, and amends disclosures requirements.

Novartis implemented the new standard IFRS 15 Revenue from Contracts with Customers as of January 1, 2018. The new standard amends revenue recognition requirements and establishes principles for reporting information about the nature, amount, timing and uncertainty of revenue and cash flows arising from contracts with customers. The standard replaces IAS 18 Revenue and IAS 11 Construction contracts and related interpretations.

The Group applied the modified retrospective method upon adoption of IFRS 9 and IFRS 15 on January 1, 2018. This method requires the recognition of the cumulative effect of initially applying IFRS 9 and IFRS 15 to retained earnings and not to restate prior years. As a result, the critical accounting policies related to revenue and trade receivables described below are applicable to the preparation of the 2018 consolidated financial statements. The accounting policies for revenue and trade receivables that are applicable to the preparation of the 2017 and 2016 consolidated financial statements are described in Note 1; see "Item 18. Financial Statements—Note 1. Significant accounting policies."

Deductions from revenues

As is typical in the pharmaceutical industry, our gross sales are subject to various deductions, which are primarily composed of rebates and discounts to retail customers, government agencies, wholesalers, health insurance companies and managed healthcare organizations. These deductions represent estimates of the related obligations, requiring the use of judgment when estimating the effect of these sales deductions on gross sales for a reporting period. These adjustments are deducted from gross sales to arrive at net sales.

The following summarizes the nature of some of these deductions and how the deduction is estimated. After recording these, net sales represent our best estimate of the cash that we expect to ultimately collect. The US market has the most complex arrangements related to revenue deductions.

United States-specific healthcare plans and program rebates

The United States Medicaid Drug Rebate Program is administered by state governments, using state and federal funds to provide assistance to certain vulnerable and needy individuals and families. Calculating the rebates to be paid related to this program involves interpreting relevant regulations, which are subject to challenge or change in interpretative guidance by government authorities. Provisions for estimating Medicaid rebates are calculated using a combination of historical experience, product and population growth, product pricing, and the mix of contracts and specific terms in the individual state agreements.

The United States Federal Medicare Program, which funds healthcare benefits to individuals age 65 and older, and to people with certain disabilities, provides prescription drug benefits under the Part D section of the program. This benefit is provided and administered through private prescription drug plans. Provisions for estimating Medicare Part D rebates are calculated based on the terms of individual plan agreements, product sales and population growth, product pricing, and the mix of contracts.

We offer rebates to key managed healthcare and private plans in an effort to sustain and increase the market share of our products, and to ensure patient access to our products. These programs provide a rebate after the plans have demonstrated they have met all terms and conditions set forth in their contract with us.

These rebates are estimated based on the terms of individual agreements, historical experience, product pricing, and projected product growth rates, and are recorded as a deduction from revenue at the time, the related revenues are recorded.

These provisions are adjusted based on established processes and experiences from filing data with individual states and plans. There is often a time lag of several months between the recording of the revenue deductions and the final accounting for them.

Non-United States-specific healthcare plans and program rebates

In certain countries other than the US, we provide rebates to governments and other entities. These rebates are often mandated by laws or government regulations.

In several countries, we enter into innovative pay- for- performance arrangements with certain healthcare providers. Under these agreements, we may be required to make refunds to the healthcare providers or to provide additional medicines free of charge if anticipated treat-

ment outcomes do not meet predefined targets. Potential refunds or the delivery of additional medicines at no cost are estimated and recorded as a deduction from revenue at the time the related revenues are recorded. Estimates are based on historical experience and clinical data. In cases where historical experience and clinical data are not sufficient for a reliable estimation of the outcome, revenue recognition is deferred until such history is available.

In addition, we offer global patient assistance programs.

There is often a time lag of several months between us recording the revenue deductions and our final accounting for them.

Non-healthcare plans and program rebates, returns and other deductions

We offer rebates to purchasing organizations and other direct and indirect customers to sustain and increase market share and to ensure patient access to our products. Since rebates are contractually agreed upon, the related provisions are estimated based on the terms of the individual agreements, historical experience, and projected product sales growth rates.

Chargebacks occur where our subsidiaries have arrangements with indirect customers to sell products at prices that are lower than the price charged to wholesalers. A chargeback represents the difference between the invoice price to the wholesaler and the indirect customer's contract price. We account for vendor chargebacks by reducing revenue by the estimate of chargebacks attributable to a sales transaction. Provisions for estimated chargebacks are calculated using a combination of factors, such as historical experience, product growth rates, product pricing, level of inventory in the distribution channel and the terms of individual agreements.

When we sell a product providing a customer the right to return it, we record a provision for estimated sales returns based on our sales return policy and historical return rates. Other factors considered include actual product recalls, expected marketplace changes, the remaining shelf life of the product, and the expected entry of generic products. In 2018, sales returns amounted to approximately 1% of gross product sales. If sufficient experience is not available, sales are only recorded based on evidence of product consumption or when the right of return has expired.

We enter into distribution service agreements with major wholesalers, which provide a financial disincentive for the wholesalers to purchase product quantities in excess of current customer demand. Where possible, we adjust shipping patterns for our products to maintain wholesalers' inventory levels consistent with underlying patient demand.

We offer cash discounts to customers to encourage prompt payment. Cash discounts are estimated and accrued at the time of invoicing and are deducted from revenue.

Following a decrease in the price of a product, we generally grant customers a "shelf stock adjustment" for their existing inventory for the relevant product. Provisions for shelf stock adjustments, which are primarily relevant within the Sandoz Division, are determined at the time of the price decline or at the point of sale, if the impact of a price decline on the products sold can be reasonably estimated based on the customer's inventory levels of the relevant product.

Other sales discounts, such as consumer coupons and co-pay discount cards, are offered in some markets. The estimated amounts of these discounts are recorded at the time of sale or when the coupons are issued, and are estimated utilizing historical experience and the specific terms for each program. If a discount for a probable future transaction is offered as part of a sales transaction, then an appropriate portion of revenue is deferred to cover this estimated obligation.

We adjust provisions for revenue deductions periodically to reflect actual experience. To evaluate the adequacy of provision balances, we use internal and external estimates of the inventory in transit, the level of inventory in the distribution and retail channels, actual claims data received, and the time lag for processing rebate claims. External data sources include reports from wholesalers and third-party market data purchased by Novartis.

For the table showing the worldwide extent of our revenue deductions provisions and related payment experiences for the Group see "Item 18. Financial Statements – Note 21 Provisions and other current liabilities".

Gross-to-net sales reconciliation

The table below shows the gross to net sales reconciliation for our Innovative Medicines Division:

	Income statement charge			
	Charged through revenue deduction provisions USD millions	Charged directly without being recorded in revenue deduction provisions USD millions	Total USD millions	In % of gross sales
2018				
Innovative Medicines gross sales subject to deductions			47 785	100.0
US-specific healthcare plans and program rebates	– 3 921		– 3 921	– 8.2
Non-US-specific healthcare plans and program rebates	– 2 108	– 1 032	– 3 140	– 6.6
Non-healthcare plans and program-related rebates, returns and other deductions	– 3 157	– 2 675	– 5 832	– 12.2
Total Innovative Medicines gross-to-net sales adjustments	– 9 186	– 3 707	– 12 893	– 27.0
Innovative Medicines net sales 2018			34 892	73.0
2017[1]				
Innovative Medicines gross sales subject to deductions			43 127	100.0
US-specific healthcare plans and program rebates	– 3 303		– 3 303	– 7.7
Non-US-specific healthcare plans and program rebates	– 1 712	– 940	– 2 652	– 6.1
Non-healthcare plans and program-related rebates, returns and other deductions	– 2 652	– 2 242	– 4 894	– 11.4
Total Innovative Medicines gross-to-net sales adjustments	– 7 667	– 3 182	– 10 849	– 25.2
Innovative Medicines net sales 2017			32 278	74.8
2016[1]				
Innovative Medicines gross sales subject to deductions			41 798	100.0
US-specific healthcare plans and program rebates	– 3 051		– 3 051	– 7.3
Non-US-specific healthcare plans and program rebates	– 1 341	– 873	– 2 214	– 5.3
Non-healthcare plans and program-related rebates, returns and other deductions	– 2 696	– 2 006	– 4 702	– 11.2
Total Innovative Medicines gross-to-net sales adjustments	– 7 088	– 2 879	– 9 967	– 23.8
Innovative Medicines net sales 2016			31 831	76.2

[1] Restated to reflect the product transfers between divisions, that was effective as of January 1, 2018

Surgical equipment revenue

Surgical equipment may be sold together with other products and services under a single contract. Revenues are recognized upon satisfaction of each of the performance obligations in the contract and the consideration is allocated based on the standalone selling price of each performance obligation.

For surgical equipment, in addition to cash and installment sales, revenue is recognized under finance and operating lease arrangements. Arrangements in which Novartis transfers substantially all the risks and rewards incidental to ownership to the customer are treated as finance lease arrangements. Revenue from finance lease arrangements is recognized at amounts equal to the fair values of the equipment, which approximate the present values of the minimum lease payments under the arrangements. As interest rates embedded in lease arrangements are

approximately market rates, revenue under finance lease arrangements is comparable to revenue for outright sales. Finance income for arrangements in excess of twelve months is deferred and subsequently recognized based on a pattern that approximates the use of the effective interest method. It is recorded in “Other income.” Operating lease revenue for equipment rentals is recognized on a straight line basis over the lease term.

Impairment of goodwill, intangible assets and property, plant and equipment

We review long-lived intangible assets and property, plant and equipment for impairment whenever events or changes in circumstance indicate that the asset’s balance sheet carrying amount may not be recoverable. Goodwill, the Alcon brand name and other currently not amortized intangible assets are reviewed for impairment at least annually.

An asset is generally considered impaired when its balance sheet carrying amount exceeds its estimated recoverable amount, which is defined as the higher of its fair value less costs of disposal and its value in use. Usually, Novartis adopts the fair value less costs of disposal method for its impairment evaluation. In most cases, no directly observable market inputs are available to measure the fair value less costs of disposal. Therefore, an estimate of fair value less costs of disposal is derived indirectly and is based on net present value techniques utilizing post-tax cash flows and discount rates. In the

limited cases where the value in use method is applied, net present value techniques are utilized using pre-tax cash flows and discount rates.

Fair value reflects estimates of assumptions that market participants would be expected to use when pricing the asset and, for this purpose, management considers the range of economic conditions that are expected to exist over the remaining useful life of the asset. The estimates used in calculating net present values are highly sensitive and depend on assumptions specific to the nature of the Group's activities with regard to:

• The amount and timing of projected cash flows
• The behavior of competitors (launch of competing products, marketing initiatives, etc.)
• The probability of obtaining regulatory approvals
• Future tax rates
• The appropriate royalty rate for the Alcon brand name
• The appropriate terminal growth rate
• The appropriate discount rate

Due to the above factors and those further described in "Item 18. Financial Statements—Note 1. Significant accounting policies – Impairment of goodwill and intangible assets", actual cash flows and values could vary significantly from forecasted future cash flows and related values derived using discounting techniques.

The recoverable amount of the grouping of cash-generating units to which goodwill and indefinite life intangible assets are allocated is based on fair value less costs of disposal. The valuations are derived from applying discounted future cash flows based on key assumptions, including the terminal growth rate and discount rate. For additional information, see "Item 18. Financial Statements – Note 1. Significant accounting policies – Impairment of goodwill and intangible assets and Note 10. Goodwill and intangible assets."

In 2018, intangible asset impairment charges of USD 1.2 billion were recognized, of which USD 592 million was recorded in the Innovative Medicines Division, USD 249 million was recorded in the Sandoz Division, and USD 391 million was recorded in the Alcon Division.

In 2017, intangible asset impairment charges of USD 709 million were recognized, of which USD 591 million was recorded in the Innovative Medicines Division, USD 61 million was recorded in the Sandoz Division, and USD 57 million was recorded in the Alcon Division.

In 2016, intangible asset impairment charges of USD 591 million were recognized, of which USD 522 million was recorded in the Innovative Medicines Division, USD 65 million was recorded in the Sandoz Division, and USD 4 million was recorded in the Alcon Division.

In 2018, 2017 and in 2016, there were no reversals of prior-year impairment charges.

Goodwill and other intangible assets represent a significant part of our consolidated balance sheet, primarily due to acquisitions. Although no significant additional impairments are currently anticipated, impairment evaluation could lead to material impairment charges in the future. For more information, see "Item 18. Financial Statements—Note 10. Goodwill and intangible assets."

Additionally, net impairment charges for property, plant and equipment during 2018 amounted to USD 304 million (2017: USD 157 million; 2016: USD 102 million).

Impairment of associated companies accounted for at equity

Novartis considers investments in associated companies for impairment evaluation whenever objective evidence indicates the net investment may be impaired, including when a quoted share price indicates a fair value less than the per share balance sheet carrying value for the investment.

If the recoverable amount of the investment is estimated to be lower than the balance sheet carrying amount, an impairment charge is recognized for the difference in the consolidated income statement under "Income from associated companies."

Trade receivables

Trade receivables are initially recognized at their invoiced amounts, including any related sales taxes less adjustments for estimated revenue deductions such as rebates, chargebacks and cash discounts.

From January 1, 2018, with the adoption of IFRS 9 Financial Instruments, provisions for expected credit losses are established using an expected credit loss model (ECL). The provisions are based on a forward-looking ECL, which includes possible default events on the trade receivables over the entire holding period of the trade receivable. These provisions represent the difference between the trade receivable's carrying amount in the consolidated balance sheet

and the estimated collectible amount. Charges for doubtful trade receivables are recorded as marketing and selling costs recognized in the consolidated income statement within “Selling, General & Administration” expenses.
Trade receivable balances include sales to drug wholesalers, retailers, private health systems, government agencies, managed care providers, pharmacy benefit managers and government-supported healthcare systems. Novartis continues to monitor sovereign debt issues and economic conditions in Greece, Italy, Portugal, Spain, Brazil, Russia, Saudi Arabia, Turkey, Argentina, and other countries, and evaluates trade receivables in these countries for potential collection risks. Substantially all of the trade receivables overdue from Greece, Portugal, Spain, Brazil, Argentina and Saudi Arabia are due directly from local governments or from government-funded entities. Deteriorating credit and economic conditions as well as other factors in these countries have resulted in – and may continue to result in – an increase in the average length of time that it takes to collect these trade receivables, and may require the Group to re-evaluate the estimated collectable amount of these trade receivables in future periods.
Contingent consideration
In a business combination or divestment of a business, it is necessary to recognize contingent future payments to previous owners representing contractually defined potential amounts as a liability or asset. Usually for Novartis, these are linked to milestone or royalty pay-

ments related to certain assets and are recognized as a financial liability or financial asset at their fair value, which is then remeasured at each subsequent reporting date. These estimations typically depend on factors such as technical milestones or market performance, and are adjusted for the probability of their likelihood of payment and, if material, are appropriately discounted to reflect the impact of time.

Changes in the fair value of contingent consideration liabilities in subsequent periods are recognized in the consolidated income statement in “Cost of goods sold” for currently marketed products and in “Research and development” for In-Process Research and Development (IPR&D). Changes in contingent consideration assets are recognized in “Other income” or “Other expense,” depending on its nature.

The effect of unwinding the discount over time is recognized for contingent liabilities in “Interest expense” and for contingent assets are recorded as interest income recognized in the consolidated income statement within “other financial income and expense”.

Retirement and other post-employment benefit plans

We sponsor pension and other post-employment benefit plans in various forms that cover a significant portion of our current and former associates. For post-employment plans with defined benefit obligations, we are required to make significant assumptions and estimates about future events in calculating the expense and the present value of the liability related to these plans. These include assumptions about the interest rates we apply to estimate future defined benefit obligations and net periodic pension expense, as well as rates of future pension increases. In addition, our actuarial consultants provide our management with historical statistical information, such as withdrawal and mortality rates in connection with these estimates.

Assumptions and estimates used by the Group may differ materially from the actual results we experience due to changing market and economic conditions, higher or lower withdrawal rates, and longer or shorter life spans of participants, among other factors. For example, in 2018, a decrease in the interest rate we apply in determining the present value of the defined benefit obligations of one-quarter of 1% would have increased our year-end defined benefit pension obligation for plans in Switzerland, the United States, the United Kingdom, Germany and Japan, which represent 94% of the Group total defined benefit pension obligation, by approximately USD 0.8 billion. Similarly, if the 2018 interest rate had been one-quarter of 1 percentage point lower than actually assumed, the net periodic pension cost for pension plans in these countries, which represent about 86% of the Group’s total net periodic pension cost for pension plans, would have increased by approximately USD 26 million. Depending on events, such differences could have a material effect on our total equity. For more information on obligations under retirement and other post-employment benefit plans and underlying actuarial assumptions, see “Item 18. Financial Statements—Note 24. Post-employment benefits for associates.”

Provisions and contingencies

A number of Group companies are involved in various government investigations and legal proceedings (intellectual property, sales and marketing practices, product liability, commercial, employment and wrongful discharge, environmental claims, etc.) arising out of the normal conduct of their businesses. For more information, see “Item 18. Financial Statements—Note 19. Provisions and other non-current liabilities” and “Item 18. Financial Statements—Note 27. Commitments and contingencies.”

We record provisions for legal proceedings when it is probable that a liability has been incurred and the amount can be reliably estimated. These provisions are adjusted periodically as assessments change or additional information becomes available. For significant product liability cases, the provision is actuarially determined based on factors such as past experience, amount and number of claims reported, and estimates of claims incurred but not yet reported. Provisions are recorded for environmental remediation costs when expenditure on remedial work is probable and the cost can be reliably estimated. Remediation costs are provided for under “Non-current liabilities” in the Group’s consolidated balance sheet.

Provisions relating to estimated future expenditure for liabilities do not usually reflect any insurance or other claims or recoveries, since these are only recognized as assets when the amount is reasonably estimable and collection is virtually certain.

Research and development

Internal research and development costs are fully charged to the consolidated income statement in the period in which they are incurred. We consider that regulatory and other uncertainties inherent in the development of new products preclude the capitalization of internal development expenses as an intangible asset usually until marketing approval

from the regulatory authority is obtained in a relevant major market, such as for the United States, the European Union, Switzerland or Japan.

Healthcare contributions

In many countries, our subsidiaries are required to make contributions to the countries' healthcare costs as part of programs other than the ones mentioned above under deductions from revenues. The amounts to be paid depend on various criteria such as the subsidiary's market share or sales volume compared to certain targets. Considerable judgment is required in estimating these contributions, as not all data is available when the estimates need to be made. The largest of these healthcare contributions relates to the US Healthcare Reform fee, which was introduced in 2011. This fee is an annual levy to be paid by US pharmaceutical companies, including various Novartis subsidiaries, based on each company's prior-year qualifying sales as a percentage of the prior year's government-funded program sales. This pharmaceutical fee levy is recognized in "Other expense."

Taxes

We prepare and file our tax returns based on an interpretation of tax laws and regulations, and we record estimates based on these judgments and interpretations. Our tax returns are subject to examination by the competent taxing authorities, which may result in an assessment being made, requiring payments of additional tax, interest or penalties. Since Novartis uses its intellectual property globally to deliver goods and services, the transfer prices within the Group as well as arrangements between subsidiaries to finance research and development and other activities may be challenged by the national tax authorities in any of the jurisdictions in which Novartis operates. Therefore, inherent uncertainties exist in our estimates of our tax positions, but we believe that our estimated amounts for current and deferred tax assets or liabilities, including any amounts related to any uncertain tax positions, are appropriate based on currently known facts and circumstances.

Internal control over financial reporting

The Group's management has assessed the effectiveness of internal control over financial reporting. The Group's independent statutory auditor also issued an opinion on the effectiveness of internal control over financial reporting. Both the Group's management and its external auditors concluded that the Group maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018.

Factors affecting results of operations

Transformational changes fueling demand

Accelerating biomedical innovation

We are seeing an explosion of innovation in medical science. Better understanding of the molecular mechanisms of disease, coupled with new types of therapies, promises to yield powerful new medicines for patients. The trend toward patient-specific precision treatments will likely accelerate.

Further advances in molecular biology, which has been a mainstay of research for decades, is expected to continue to yield results. In addition, new molecular techniques, such as gene editing, personalized cell therapies and harnessing the cell's own waste disposal system, could open new treatment opportunities – including ones that go beyond what has been possible using today's drugs.

The advent of digital technologies as therapeutic aids is also starting to alter the conventional notion of medical treatment. For instance, mobile applications that aim to treat substance abuse and help diabetics manage their disease have received clearance from the FDA. Combining traditional medicines with digital technology that helps patients follow healthy behaviors holds great promise for improving the quality of care as well as treatment outcomes for patients.

Transforming how doctors diagnose and treat diseases

Although the digital revolution has been relatively slow to arrive in healthcare, it is gaining momentum and will likely bring radical change in the coming years.

A growing proliferation of sensor technology is helping researchers and doctors gather increasing amounts of information about patients' health and how they respond to treatment. Care providers are starting to mine healthcare data using a combination of statistical methods and artificial intelligence to flag emerging medical problems and help physicians diagnose and treat patients.

Patients, armed with greater access to their own medical data, will likely play a more active role in preventing diseases and managing their own care when they become ill. The role of physicians and other care providers will likely also evolve as they help educate patients on treatment options and steer patients toward the most effective choices.

Transforming drug research and development

Digital technology may also increasingly improve the efficiency and effectiveness of researching and developing potential new therapies. The marriage of data and artificial intelligence could enable complex biological simulations that complement human scientific ingenuity. Such tools are already being considered by the FDA as replacements for preclinical animal studies to assess toxicity in potential new medicines. In 2017, for example, the FDA announced a collaboration with Emulate, Inc. to evaluate the company's "organs-on-chips" technology – part of a system that recreates the physiology of human tissues and organs, and is designed to predict human responses to diseases with greater precision than animal-based testing. As digital tools become more widespread, they may be able to shorten research times and improve the likelihood that experimental drugs will prove safe and effective.

This surge in medical innovation will likely occur in an increasingly diverse and fragmented research environment, with new advances coming from a variety of sources – sometimes unexpected ones. Molecular biology may intersect

with other disciplines, from engineering to computer science, to advance the practice of medicine. And we expect there will be greater diversity in funding for research. Already we see governments, companies and venture capitalists increasingly supporting academic researchers' efforts to advance promising experimental therapies.

All of these factors are contributing to greater competition at the forefront of innovation in medical science. One upshot is that medicines will likely be held to a higher standard of efficacy in the future.

Aging populations

While accelerating medical innovation could help tame some of the devastating diseases that still plague humanity, other trends in society pose significant challenges. Rapidly aging populations continue to put pressure on health systems around the world.

People are living longer and the worldwide elderly population continues to grow at a rapid pace. The number of people in the world aged 60 or over will reach nearly 2.1 billion by 2050, according to projections by the United Nations, up from less than 1 billion today. Aging populations, in addition to rapid urbanization and changing lifestyles in the developing world, are contributing to increased prevalence of chronic ailments such as heart disease and cancer. At the same time, many countries are working to expand access to healthcare. For example, China has expanded reimbursement of some medicines.

These factors are driving higher healthcare spending, which is expected to grow at an annual rate of 4.3% between 2015 and 2020, reaching a total of USD 8.7 trillion worldwide, projects the Economist Intelligence Unit. By 2020, about half of that spending is expected to go toward treating the three leading causes of death worldwide: cardiovascular disease, cancer and respiratory disease.

To keep costs in check, governments and health insurers are already employing a variety of tactics, including increasing the use of generics and biosimilars, imposing price cuts, and limiting access to some innovative therapies. The pharmaceutical industry is also playing a role, exploring new pricing models and delivering innovative new treatments that maximize benefits for patients.

Better health outcomes for patients

In pursuit of greater efficiency and effectiveness, some healthcare systems are also expediting the transition from a system based on fees for services toward one based on reimbursement for specific health outcomes in patients. As the transition accelerates, we expect health systems will increasingly find ways to discourage the use of medical treatments that bring little or no value for patients or healthcare systems. In parallel, they will likely place greater value on treatments that delay the progression of disease or that help avoid events requiring expensive acute care, such as heart attacks.

With people living longer and retirement ages rising, we also anticipate countries and health systems will put greater emphasis on keeping people fit and productive later in life. And we think there will be growing emphasis on maintaining quality of life as people age, with less focus on extending life by a few more months.

We think the trends driving changes in healthcare will bring new opportunities for Novartis, as well as new challenges. And we believe the changes now underway in our industry raise the importance of delivering true innovation that produces better health outcomes for patients and health systems, with greater efficiency.

Increasingly challenging business environment

Loss of exclusivity for patented products

Pharmaceutical companies routinely face generic competition when their products lose patent or other intellectual property protection, and Novartis is no exception. Major products of our Innovative Medicines Division, as well as certain products of our Alcon and Sandoz Divisions, are protected by patent or other intellectual property rights, allowing us to exclusively market those products. The loss of exclusivity has had, and will continue to have, an adverse effect on our results. In 2018, the total impact of generic competition on our net sales amounted to approximately USD 1 billion.

Some of our best selling products face or are expected to face considerable competition due to the expiration of patent or other intellectual property protection. For example, our former top selling products *Gleevec*/*Glivec*, *Diovan* and *Exforge* all face continued and increasing generic competition in major markets. which will continue. Patent protection for our *Sandostatin* products has expired and there is a risk that generic competition for *Sandostatin LAR* may arise in the future. Looking forward, intellectual property protecting a number of our major products will expire at various times in the coming years, raising the likelihood of further generic competition. Among our products expected to begin losing intellectual property protection in key countries during the coming years are *Gilenya*, our everolimus products (*Afinitor*/*Votubia* and *Certican*/*Zortress*), *Exjade*/*Jadenu* and *Lucentis*.

To counter the impact of patent expirations, we continuously invest in R&D to rejuvenate our portfolio. For example, in 2018, we invested 17% of total net sales in R&D. One measure of the output of our efforts is the performance of our growth drivers, including *Cosentyx, Entresto, Kymriah* and *Kisqali*, and the Sandoz biosimilars. Novartis also has a number of late stage product candidates in its pipeline with the potential to come to market in the next few years.

Novartis plans to launch three potentially significant products in 2019, AVXS-101, BAF312 and RTH258 (brolucizumab).

Commercial success of key products

Our ability to maintain and grow our business and to replace revenue and income lost to generic and other competitors depends in part on our commercial success, particularly with respect to our key growth driver products, which we consider to be an indicator of our ability to renew our portfolio. The commercial success of these products could be impacted at any time by a number of factors, including new competitors, changes in doctors' prescribing habits, pricing pressure, manufacturing issues, and loss of intellectual property protection. In addition, our revenue could be significantly impacted by the timing and rate of commercial acceptance of new products.

All of our businesses face intense competition from new products and scientific advances from competitors. Physicians, patients and payers may choose competitor products instead of ours if they perceive them to be better in terms of efficacy, safety, cost or convenience.

For example, our US Sandoz business has suffered significant declines in sales and profits in recent years due, at least in part, to increased competition for its products. There can be no certainty that Sandoz US sales will recover in the coming years. In any event, such competition and the costs of our efforts to improve the business's performance, as well as other factors, can be expected to affect the business, financial condition or results of operations of this organization, at least in the near term. In addition, despite the devotion of significant resources to our efforts to improve the performance of Sandoz US, and our agreement to sell the Sandoz US dermatology business and generic US oral solids portfolio to Aurobindo Pharma USA Inc., our efforts may ultimately prove insufficient. Should our efforts fail to accomplish their goals, or fail to do so in a timely manner, it could have a material adverse impact on our business, financial condition or results of operations beyond the near term, as well.

Ability to deliver new products

Our ability to grow depends not only on the commercial success of our marketed products, but also on the success of our R&D activities in identifying and developing new treatments that address unmet medical needs, are accepted by patients and physicians, and are reimbursed by payers.

Developing new healthcare products and bringing them to market is a costly, lengthy and uncertain process. R&D for a new product in our Innovative Medicines Division can take 15 years or more, from discovery to commercial launch. With time limits on intellectual property protections, the longer it takes to develop a product, the less time we may have to recoup our costs. During each stage of development, there is a significant risk that we will encounter obstacles. They may cause a delay or add substantial expense, limit the potential for commercial success, or force us to abandon a product in which we have invested substantial amounts of time and money.

In addition, as healthcare costs continue to rise, governments and payers around the world are increasingly focused on health outcomes, rewarding new products that represent truly breakthrough innovation versus those that offer an incremental benefit over other products in the same therapeutic class. This has led to requests for more clinical trial data than has been required in the past, the inclusion of significantly higher numbers of patients in clinical trials, and more detailed analyses of the trials. As a result, despite significant efforts by health authorities such as the FDA to accelerate the development of new drugs, the already lengthy and expensive process of obtaining regulatory approvals and reimbursement for pharmaceutical products has become even more challenging.

Our Sandoz Division faces similar challenges, particularly in the development of biosimilars. While Sandoz was a pioneer in introducing biosimilars to the European market in 2006, and was the first company to win approval for a biosimilar under the new regulatory pathway in the United States in 2015, many countries still lack fully developed regulatory frameworks for the development, approval and marketing of biosimilars. Further delays in establishing regulatory frameworks, or any other difficulties that may arise in the development or marketing of biosimilars, could put at risk the significant investments that Sandoz has made, and will continue to make, in this area.

Our Alcon Division faces medical device development and approval processes that are often similarly difficult. As part of its growth plan, Alcon has taken steps to accelerate innovation. It has started to see the results of its efforts, with the approval and launch of intraocular lens innovations in recent years, including *Clareon* and *PanOptix* IOLs, *AutonoMe* and *Ultrasert* IOL delivery systems, and, *ReSTOR* Toric IOL with *ACTIVEFOCUS* optical design, as well as a multifocal version of *Dailies Total1*. But there is no certainty that Alcon will continue to be successful in these efforts, and if it is not, there could be a material adverse effect on the success of the Alcon Division, and on the Group as a whole.

In spite of our significant investments, there can be no guarantee that our R&D activities will produce commercially viable new products that will enable us to grow our business and replace revenue and income lost to competition.

Pricing and reimbursement

Around the world, governments and payers continue to struggle with rising healthcare costs as aging populations contribute to increased prevalence of chronic diseases. There have also been examples of significant controversies about prices for pharmaceuticals that some politicians and members of the public have considered excessive. These factors have intensified the pressures we face regarding the prices we charge for our drugs, and our ability to establish satisfactory rates of reimbursement for our products by governments, insurers and other payers.

We expect scrutiny to continue in 2019, and the following years, as governments and insurers around the world strive to reduce healthcare costs through steps such as restricting access to higher priced new medicines, increasing coinsurance or copays owed by patients for medicines, increasing the use of generics, and imposing price cuts. In this environment, we believe it is more important than ever to demonstrate the value that true innovation brings to the

healthcare system.

To manage these pressures, we are investing in real world data and analytics to provide additional evidence of the health benefits of our products, exploring new technologies and patient management services, and partnering with payers to develop and scale outcomes based commercial models. For example, we are working with customers on flexible pricing approaches where we are fully compensated only if a drug succeeds in meeting certain performance targets.

Business practices

In recent years, there has been a trend of increasing government investigations and litigation against companies operating in our industry, including in the United States and other countries. We are obligated to comply with the laws of all countries in which we operate, as well as any new requirements that may be imposed upon us. In addition, governments and regulatory authorities worldwide

are also increasingly challenging practices previously considered to be legal and compliant. But beyond legal requirements, we strive to meet evolving public expectations for ethical behavior. We have a significant global compliance program in place, and we devote substantial time and resources to efforts to ensure that our business is conducted in a legal and publicly acceptable manner. Despite these efforts, any failure to comply with the law could lead to substantial liabilities that may not be covered by insurance and could affect our business and reputation. Responding to these challenges and new regulations is costly. Investigations and litigation may affect our reputation, create a risk of potential exclusion from government reimbursement programs in the United States and other countries, and potentially lead to large damage payments and agreements intended to regulate company behavior. This is why we continued to strengthen the Integrity & Compliance function in 2018. The function is headed by our Chief Ethics, Risk and Compliance Officer, who reports directly to the CEO of Novartis.

Investors and Novartis are increasingly focused on Environmental, Social and Governance (ESG) issues. Novartis has made strides to transform culture and return more to society in 2018, which are two of the key priorities of our new CEO. We continue our journey to rebuild trust with society and for all our new medicines, we will systematically integrate access strategies in how we research, develop and deliver globally and we are developing innovative treatments for under-treated diseases, including SEG101 in sickle cell disease.

Supply continuity

The production of pharmaceutical products and medical devices can be highly complex, and any manufacturing issue compromising supply or quality could have serious consequences for the health of patients. For this reason, there are strict regulatory requirements surrounding our manufacturing processes, which, in addition to our own quality standards, introduce a greater chance for disruptions and liabilities. Any significant failure by us or our third party suppliers to comply with these requirements or the health authorities' expectations may cause us to shut down the production facilities or production lines. Alternately, we may be forced to shut them down by a government health authority.

Beyond regulatory requirements, many of our products involve technically sophisticated manufacturing processes or require specialized raw materials. For example, we manufacture and sell a number of sterile products, biologic products and products involving advanced therapy platforms, such as CAR-T therapies, gene therapy and radioligand therapy, all of which are particularly complex and involve highly specialized manufacturing technologies. As a result, even slight deviations at any point in their production process may lead to production failures or recalls.

Given the complexity of our manufacturing processes, we have worked for several years to adopt a single high quality standard across the company. We believe these efforts are having an impact. The results of inspections by regulatory agencies in 2018 were consistent with the year before. Out of a total of 192 inspections, all but two (99%) were without major findings.

IT security, data integrity and data privacy

We are heavily dependent on critical, complex and interdependent information technology systems, including Internet based systems, to support our business processes.

The size, age and complexity of our information technology systems make them potentially vulnerable to external and internal security threats, outages, misplaced or lost data, programming or human errors, or other similar events. Although we have devoted and continue to devote significant resources and management attention to cybersecurity, information management and business continuity efforts, like many companies, we have experienced certain of these events and expect to continue to experience them in the future, as the external and internal information security threat continues to grow. We believe that the information security incidents we have experienced to date have yet to result in significant disruptions to our operations, and have not had a significant adverse effect on our results of operations, or on third parties. However, we may not be able to prevent future outages, security incidents or other breaches in our systems from having a material adverse effect on our business, financial condition, results of operation or reputation.

In addition, our routine business operations increasingly involve our gathering personal information (including sensitive personal information) about patients, vendors, customers, employees, collaborators and others, through the use of information technologies such as the Internet, social media, mobile technologies, and technology based medical devices. Breaches of our systems or those of our third party contractors, or other failures to protect such information, could expose such people's personal data to unauthorized persons. Any event involving the substantial loss of personal data could give rise to significant potential liability, reputational harm, damaged relationships with business partners and potentially substantial monetary penalties under laws enacted or being enacted around the world. Such events

could also lead to restrictions on our ability to transfer personal data across country borders.

Transformational technologies and business models

Rapid progress in digital technologies and in the development of new business models is substantially transforming numerous industries around the world, while sometimes quickly rendering established businesses uncompetitive or obsolete. To take advantage of these opportunities, Novartis has embarked upon a digital transformation strategy, with the goal of making Novartis an industry leader in leveraging advanced analytics and other new technologies. This includes the 2018 launch of *reSET* the first digital therapeutic for substance abuse disorder. At the same time, there is a risk that other companies with specialized expertise or business models may enter the healthcare field, potentially disrupting our relationships with patients, healthcare professionals, customers, distributors and suppliers, with unknown potential consequences for us.

If we should fail to succeed in our efforts at a digital transformation of our company, then there is a risk that we may fail to create the innovative new products, tools or techniques that such technologies may make possi-

ble, or may fail to create them as quickly and efficiently as such technologies may enable. We may also lose opportunities to engage with our stakeholders and to profit from improved business processes, and may lose the resources devoted to these efforts to transform our business. At the same time, should third parties successfully enter the healthcare field with disruptive new technologies or business models, then we potentially may see our business supplanted in whole or in part by these new entrants.

Intangible assets and goodwill

We carry a significant amount of goodwill and other intangible assets on our consolidated balance sheet, primarily due to acquisitions, including the acquisition of Alcon and the oncology assets acquired from GSK. As a result, we may incur significant impairment charges if the fair value of intangible assets and groupings of cash generating units containing goodwill are less than their carrying value on the Group's consolidated balance sheet at any point in time. We regularly review our long lived intangible and tangible assets for impairment. In 2018, for example, we recorded intangible asset impairment charges of USD 1.2 billion, including USD 0.4 billion write-down of *Votrient*, USD 0.3 billion for the net charges from the voluntary withdrawal of *CyPass* and USD 0.2 billion related to the write-down of the goodwill and the currently marketed products related to the sale of the Sandoz US portfolio to Aurobindo Pharma USA Inc. Impairment testing may lead to additional impairment charges in the future. Any significant impairment charges could have a material adverse effect on our results of operations and financial condition.

Tax

Our multinational operations are taxed under the laws of the countries and other jurisdictions in which we operate. However, the integrated nature of our worldwide operations can produce conflicting claims from revenue authorities in different countries as to the profits to be taxed in the individual countries, including potential disputes relating to the prices our subsidiaries charge one another for intercompany transactions, known as transfer pricing. The majority of the jurisdictions in which we operate have double tax treaties with other foreign jurisdictions, which provide a framework for mitigating the impact of double taxation on our revenues and capital gains. However, mechanisms developed to resolve such conflicting claims are largely untried, and can be expected to be very lengthy.

In recent years, tax authorities around the world, including in the EU, Switzerland and the US, have increased their scrutiny of company tax filings, and have become more rigid in exercising any discretion they may have, and numerous changes in tax laws and rules have been enacted or proposed. The current tax regime of Switzerland is under international pressure and efforts are underway in Switzerland to transform its corporate tax laws and regulations. The outcome of these efforts remains subject to change and could end up in a materially different form from what is currently proposed, or could be administered or implemented in a manner different from our expectations.

As a result, such tax reform efforts, including with respect to tax base or rate, transfer pricing, intercompany dividends, cross border transactions, controlled corporations, and limitations on tax relief allowed on the interest on intercompany debt, will require us to continually assess our organizational structure against tax policy trends, and could lead to an increased risk of international tax disputes and an increase in our effective tax rate, and could adversely affect our financial results.

Approach to risk management

See "Item 6. Directors, Senior Management and Employees—Item 6.C Board Practices—Our Board of Directors—Information and control systems of the Board vis-à-vis management—Risk management" and "Item 18. Financial Statements—Note 28. Financial instruments—additional disclosures."

Non-IFRS measures as defined by Novartis

Novartis uses certain non-IFRS metrics when measuring performance, especially when measuring current-year results against prior periods, including core results, constant currencies, free cash flow and net debt.

Despite the use of these measures by management in setting goals and measuring the Group's performance, these are non-IFRS measures that have no standardized meaning prescribed by IFRS. As a result, such measures have limits in their usefulness to investors.

Because of their non-standardized definitions, the non-IFRS measures (unlike IFRS measures) may not be comparable to the calculation of similar measures of other companies. These non-IFRS measures are presented solely to permit investors to more fully understand how the Group's management assesses underlying performance. These non-IFRS measures are not, and should not be viewed as, a substitute for IFRS measures.

As an internal measure of Group performance, these non-IFRS measures have limitations, and the Group's performance management process is not solely restricted to these metrics.

Core results

The Group's core results – including core operating income, core net income and core earnings per share – exclude fully the amortization and impairment charges of intangible assets, except software, net gains and losses on fund investments and equity securities valued at fair value through profit and loss, and certain acquisition-related items. The following items that exceed a threshold of USD 25 million are also excluded: integration- and divestment-related income and expenses;

divestment gains and losses; restructuring charges/releases and related items; legal-related items; impairments of property, plant and equipment, and financial assets; as well as income and expense items that management deems exceptional and that are or are expected to accumulate within the year to be over a USD 25 million threshold.

Novartis believes that investor understanding of the Group's performance is enhanced by disclosing core measures of performance because, since they exclude items that can vary significantly from year to year, the core measures enable better comparison of business performance across years. For this same reason, Novartis uses these core measures in addition to IFRS and other measures as important factors in assessing the Group's performance.

The following are examples of how these core measures are utilized:

• In addition to monthly reports containing financial information prepared under IFRS, senior management receives a monthly analysis incorporating these core measures.

• Annual budgets are prepared for both IFRS and core measures.

A limitation of the core measures is that they provide a view of the Group's operations without including all events during a period, such as the effects of an acquisition, divestments, or amortization/impairments of purchased intangible assets and restructurings.

Constant currencies

Changes in the relative values of non-US currencies to the US dollar can affect the Group's financial results and financial position. To provide additional information that may be useful to investors, including changes in sales volume, we present information about our net sales and various values relating to operating and net income that are adjusted for such foreign currency effects.

Constant currency calculations have the goal of eliminating two exchange rate effects so that an estimate can be made of underlying changes in the consolidated income statement excluding the impact of fluctuations in exchange rates:

• The impact of translating the income statements of consolidated entities from their non-US dollar functional currencies to US dollars

• The impact of exchange rate movements on the major transactions of consolidated entities performed in currencies other than their functional currency

We calculate constant currency measures by translating the current year's foreign currency values for sales and other income statement items into US dollars, using the average exchange rates from the prior year and comparing them to the prior-year values in US dollars.

We use these constant currency measures in evaluating the Group's performance, since they may assist us in evaluating our ongoing performance from year to year. However, in performing our evaluation, we also consider equivalent measures of performance that are not affected by changes in the relative value of currencies.

Free cash flow

Free cash flow is presented as additional information because management believes it is a useful supplemental indicator of the Group's ability to operate without reliance on additional borrowing or use of existing cash. Free cash flow is a measure of the net cash generated that is available for debt repayment and investment in strategic opportunities, and for returning to shareholders. Free cash flow is a non-IFRS measure, which means it should not be interpreted as a measure determined under IFRS. Free cash flow is not intended to be a substitute measure for net cash flows from operating activities as determined under IFRS.

Novartis defines free cash flow as net cash flows from operating activities and cash flows associated with the purchase or sale of property, plant and equipment, as well as intangible, other non-current and financial assets, excluding marketable securities. Cash flows in connection with the acquisition or divestment of subsidiaries, associated companies and non-controlling interests in subsidiaries are not taken into account to determine free cash flow.

Net debt

Net debt is presented as additional information because management believes it is a useful supplemental indicator of the Group's ability to pay dividends, to meet financial commitments, and to invest in new strategic opportunities, including strengthening its balance sheet. Net debt is a non-IFRS measure, which means it should not be interpreted as a measure determined under IFRS.

Novartis defines net debt as current and non-current financial debt less cash and cash equivalents, current investments and derivative financial instruments.

Novartis Cash Value Added

Novartis Cash Value Added (NCVA) is a metric that is based on what the Company assesses to be its cash flow return less a capital charge on gross operating assets. NCVA is used as the primary internal financial measure for determining payouts under the Long-Term Performance Plan introduced in 2014. More information on NCVA is presented as part of the Compensation Report; see “Item 6. Directors, Senior Management and Employees—Item 6.B Compensation.”

Additional information

EBITDA

Novartis defines earnings before interest, tax, depreciation and amortization (EBITDA) as operating income, excluding depreciation of property, plant and equipment (including any related impairment charges) and amortization of intangible assets (including any related impairment charges).

(USD millions)	2018	2017	2016
Operating income	8 169	8 629	8 268
Depreciation of property, plant and equipment	1 717	1 520	1 489
Amortization of intangible assets	3 639	3 690	3 861
Impairments of property, plant and equipment, and intangible assets	1 536	866	693
EBITDA	15 061	14 705	14 311

Enterprise value

Enterprise value represents the total amount that shareholders and debt holders have invested in Novartis, less the Group’s liquidity.

(USD millions unless indicated otherwise)	Dec 31, 2018	Dec 31, 2017	Dec 31, 2016
Market capitalization	196 950	195 541	172 048
Non-controlling interests	78	59	59
Financial debts and derivatives	32 148	28 532	23 802
Liquidity	– 15 964	– 9 485	– 7 777
Enterprise value	213 212	214 647	188 132
Enterprise value/EBITDA	14	15	13

2018 and 2017 reconciliation from IFRS results to core results

(USD millions unless indicated otherwise)	Innovative Medicines 2018	Innovative Medicines 2017 restated [1]	Sandoz 2018	Sandoz 2017	Alcon 2018	Alcon 2017 restated [1]	Corporate 2018	Corporate 2017	Group 2018	Group 2017
IFRS operating income	7 871	7 595	1 332	1 368	– 194	– 3	– 840	– 331	8 169	8 629
Amortization of intangible assets	2 158	2 119	363	454	1 007	1 025			3 528	3 598
Impairments										
Intangible assets	592	591	249	61	391	57			1 232	709
Property, plant and equipment related to the Group-wide rationalization of manufacturing sites	170	7	63	60					233	67
Other property, plant and equipment	65	77		13					65	90
Financial assets [2]						29		197		226
Total impairment charges	827	675	312	134	391	86		197	1 530	1 092
Acquisition or divestment of businesses and related items										
- Income		– 2					– 21	– 115	– 21	– 117
- Expense	126	32					29	130	155	162
Total acquisition or divestment of businesses and related items, net	126	30					8	15	134	45
Other items										
Divestment gains	– 482	– 368	– 78				– 56		– 616	– 368
Financial assets - fair value adjustments [2]	– 107				– 18		113		– 12	
Restructuring and related items										
- Income	– 25	– 53	– 12	– 7	– 4	– 4	– 2	– 1	– 43	– 65
- Expense	665	268	179	134	45	34	133	29	1 022	465
Legal-related items										
- Income	– 1	– 21	– 63						– 64	– 21
- Expense	36	35	90		28	61			154	96
Additional income	– 73	– 534	– 171	– 3	– 66	– 51	– 19	– 372	– 329	– 960
Additional expense	156	273	50		90	20	54	46	350	339
Total other items	169	– 400	– 5	124	75	60	223	– 298	462	– 514
Total adjustments	3 280	2 424	670	712	1 473	1 171	231	– 86	5 654	4 221
Core operating income	11 151	10 019	2 002	2 080	1 279	1 168	– 609	– 417	13 823	12 850
as % of net sales	32.0%	31.0%	20.3%	20.7%	17.9%	17.3%			26.6%	26.2%
Income from associated companies	1	– 1	5	23			6 432	1 086	6 438	1 108
Core adjustments to income from associated companies, net of tax		1					– 5 325	226	– 5 325	227
Interest expense									– 957	– 777
									185	39

Other financial income and expense		
Taxes, adjusted for above items (core taxes)	– 2 226	– 2 056
Core net income	11 938	11 391
Core net income attributable to shareholders of Novartis AG	11 935	11 391
Core basic EPS (USD) [3]	5.15	4.86

[1] Restated to reflect the product transfers between Innovative Medicines and Alcon that was effective as of January 1, 2018

[2] For financial instruments accounted for as fair value through profit and loss, as of January 1, 2018, unrealized gains/losses on financial assets are shown under "Financial assets - fair value adjustments", due to the change in IFRS 9 (see Note 1).

[3] Earnings per share (EPS) is calculated on the amount of net income attributable to shareholders of Novartis AG.

2017 and 2016 reconciliation from IFRS results to core results

	Innovative Medicines		Sandoz		Alcon		Corporate		Group	
(USD millions unless indicated otherwise)	2017 restated [1]	2016 restated [1]	2017	2016	2017 restated [1]	2016 restated [1]	2017	2016	2017	2016
IFRS operating income	7 595	7 255	1 368	1 445	– 3	39	– 331	– 471	8 629	8 268
Amortization of intangible assets	2 119	2 316	454	460	1 025	1 025			3 598	3 801
Impairments										
Intangible assets	591	522	61	65	57	4			709	591
Property, plant and equipment related to the Group-wide rationalization of manufacturing sites	7	1	60	– 7					67	– 6
Other property, plant and equipment	77	76	13	8					90	84
Financial assets		18			29		197	99	226	117
Total impairment charges	675	617	134	66	86	4	197	99	1 092	786
Acquisition or divestment of businesses and related items										
- Income	– 2	– 68					– 115	– 229	– 117	– 297
- Expense	32	41					130	223	162	264
Total acquisition or divestment of businesses and related items, net	30	– 27					15	– 6	45	– 33
Other items										
Divestment gains	– 368	– 608		– 6				– 48	– 368	– 662
Restructuring and related items										
- Income	– 53	– 41	– 7	– 23	– 4	– 4	– 1	– 5	– 65	– 73
- Expense	268	413	134	123	34	38	29	65	465	639
Legal-related items										
- Income	– 21	– 99							– 21	– 99
- Expense	35	205			61				96	205
Additional income	– 534	– 61	– 3		– 51	– 13	– 372	– 22	– 960	– 96
Additional expense	273	84		6	20	61	46	100	339	251
Total other items	– 400	– 107	124	100	60	82	– 298	90	– 514	165
Total adjustments	2 424	2 799	712	626	1 171	1 111	– 86	183	4 221	4 719
Core operating income	10 019	10 054	2 080	2 071	1 168	1 150	– 417	– 288	12 850	12 987
as % of net sales	31.0%	31.6%	20.7%	20.4%	17.3%	17.6%			26.2%	26.8%
Income from associated companies	– 1		23	6			1 086	697	1 108	703
Core adjustments to income from associated companies, net of tax	1						226	431	227	431
Interest expense									– 777	– 707
Other financial income and expense [2]									39	– 99
									– 2 056	– 2 001

Taxes, adjusted for above items (core taxes)		
Core net income	11 391	11 314
Core net income attributable to shareholders of Novartis AG	11 391	11 307
Core basic EPS (USD) [3]	4.86	4.75

[1] Restated to reflect the product transfers between Innovative Medicines and Alcon that was effective as of January 1, 2018

[2] Adjusted for charges of USD 0.3 billion in 2016 related mainly to devaluation losses in Venezuela

[3] Earnings per share (EPS) is calculated on the amount of net income attributable to shareholders of Novartis AG.

2018, 2017 and 2016 reconciliation from IFRS results to core results – Group

2018 (USD millions unless indicated otherwise)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items [3]	Other items [4]	Core results
Gross profit	34 759	3 338	877	5	439	39 418
Operating income	8 169	3 528	1 530	134	462	13 823
Income before taxes	13 835	3 972	1 530	– 5 656	483	14 164
Taxes [5]	– 1 221					– 2 226
Net income	12 614					11 938
Basic EPS (USD) [6]	5.44					5.15
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 18 407	3 338	877	5	439	– 13 748
The following are adjustments to arrive at core operating income						
Selling, general and administration	– 16 471		2	28	12	– 16 429
Research and development	– 9 074	190	167	23	13	– 8 681
Other income	1 690			– 21	– 1 073	596
Other expense	– 2 735		484	99	1 071	– 1 081
The following are adjustments to arrive at core income before taxes						
Income from associated companies	6 438	444		– 5 790	21	1 113

[1] Amortization of intangible assets: cost of goods sold includes amortization of acquired rights to in-market products, and other production-related intangible assets; research and development includes the amortization of acquired rights, including technology platforms; income from associated companies includes USD 444 million for the Novartis share of the estimated Roche core items

[2] Impairments: cost of goods sold, selling, general and administration and research and development include impairment charges related to intangible assets; research and development also includes impairment reversals of property, plant and equipment; other expense includes impairment charges related to property, plant and equipment; cost of goods sold and other expense include impairment charges related to a disposal group held for sale for goodwill and currently marketed products

[3] Acquisition or divestment of businesses and related items, including restructuring and integration charges: cost of goods sold, selling, general and administration, research and development and other expense include charges related to acquisitions; other income and other expense include transitional service fee income and expenses, and other items related to the portfolio transformation; income from associated companies includes the pre-tax gain of USD 5.8 billion on the sale of the 36.5% investment in GSK Consumer Healthcare Holdings Ltd.

[4] Other items: cost of goods sold, selling, general and administration and research and development include charges and reversal of charges related to a product's voluntary market withdrawal; cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites; cost of goods sold, selling, general and administration, research and development, other income and other expense include other restructuring income and charges and related items; cost of goods sold and other expense include charges related to changes in a contractual agreement; cost of goods sold also includes inventory write-off and other

product recall-related costs; selling, general and administration includes a reversal of a provision; research and development includes fair value adjustments of contingent consideration liabilities, a charge for onerous contracts, and amortization of option rights; other income and other expense include fair value adjustments and divestment gains and losses on financial assets; other income also includes product divestment gains, divestment gains on property, plant and equipment, releases of accruals and a legal settlement gain; other expense includes legal-related items and restructuring charges; income from associated companies includes an adjustment of USD 21 million for the Novartis share of the estimated GSK Consumer Healthcare Holdings Ltd. core items

[5] Taxes on the adjustments between IFRS and core results take into account, for each individual item included in the adjustment, the tax rate that will finally be applicable to the item based on the jurisdiction where the adjustment will finally have a tax impact. Generally, this results in amortization and impairment of intangible assets and acquisition-related restructuring and integration items having a full tax impact. There is usually a tax impact on other items, although this is not always the case for items arising from legal settlements in certain jurisdictions. Adjustments related to income from associated companies are recorded net of any related tax effect. Due to these factors and the differing effective tax rates in the various jurisdictions, the tax on the total adjustments of USD 329 million to arrive at the core results before tax amounts to USD -1.0 billion. Excluding the gain on the sale of the 36.5% investment in GSK Cosumer Healthcare Holdings Ltd., the tax on the total adjustments of USD 6.1 billion to arrive at the core results before tax amounts to USD 1.1 billion. The average tax rate on the adjustments excluding this transaction is 17.4%

[6] Earnings per share (EPS) is calculated on the amount of net income attributable to shareholders of Novartis AG.

2017 (USD millions unless indicated otherwise)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items [3]	Other items [4]	Core results
Gross profit	32 960	3 401	92		125	36 578
Operating income	8 629	3 598	1 092	45	– 514	12 850
Income before taxes	8 999	3 974	1 093	45	– 664	13 447
Taxes [5]	– 1 296					– 2 056
Net income	7 703					11 391
Basic EPS (USD) [6]	3.28					4.86
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 17 175	3 401	92		125	– 13 557
The following are adjustments to arrive at core operating income						
Selling, general and administration	– 14 997				– 3	– 15 000
Research and development	– 8 972	197	680		– 218	– 8 313
Other income	1 969		– 9	– 117	– 1 065	778
Other expense	– 2 331		329	162	647	– 1 193
The following are adjustments to arrive at core income before taxes						
Income from associated companies	1 108	376	1		– 150	1 335

[1] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the recurring amortization of acquired rights for technology platforms; income from associated companies includes USD 376 million for the Novartis share of the estimated Roche core items

[2] Impairments: cost of goods sold and research and development include impairment charges related to intangible assets; research and development and other expense include impairment charges related to financial assets; research and development, other income and other expense include reversals and charges related to the impairment of property, plant and equipment

[3] Acquisition or divestment of businesses and related items, including restructuring and integration charges: other income and other expense include transitional service fee income and expenses, and other items related to the portfolio transformation

[4] Other items: cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites; cost of goods sold, research and development, selling, general and administration, other income and other expense include other restructuring income and charges and related items; selling, general and administration includes an income from the release of a provision; research and development includes fair value adjustments to contingent consideration liabilities; other income and other expense include legal-related items; other income also includes a gain from a Swiss pension plan amendment, product and financial asset divestment gains, a partial reversal of a prior period charge, income from a settlement of a contract dispute and a fair value adjustment to contingent consideration sales milestone receivables; other expense also includes a provision for contract termination costs, a charge for onerous contracts, and an amendment to the Swiss pension plan; income from associated companies includes an adjustment of USD 150 million for the Novartis share of

the estimated GSK Consumer Healthcare Holdings Ltd. core items

[5] Taxes on the adjustments between IFRS and core results take into account, for each individual item included in the adjustment, the tax rate that will finally be applicable to the item based on the jurisdiction where the adjustment will finally have a tax impact. Generally, this results in amortization and impairment of intangible assets and acquisition-related restructuring and integration items having a full tax impact. There is usually a tax impact on other items, although this is not always the case for items arising from legal settlements in certain jurisdictions. Adjustments related to income from associated companies are recorded net of any related tax effect. Due to these factors and the differing effective tax rates in the various jurisdictions, the tax on the total adjustments of USD 4.4 billion to arrive at the core results before tax amounts to USD 760 million. The average tax rate on the adjustments is 17.1%.

[6] Earnings per share (EPS) is calculated on the amount of net income attributable to shareholders of Novartis AG.

2016 (USD millions unless indicated otherwise)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items [3]	Other items [4]	Core results
Gross profit	31 916	3 758	96		36	35 806
Operating income	8 268	3 801	786	– 33	165	12 987
Income before taxes	7 817	4 097	786	– 33	648	13 315
Taxes [5]	– 1 119					– 2 001
Net income	6 698					11 314
Basic EPS (USD) [6]	2.82					4.75
The following are adjustments to arrive at core gross profit						
Other revenues	918				– 50	868
Cost of goods sold	– 17 520	3 758	96		86	– 13 580
The following are adjustments to arrive at core operating income						
Selling, general and administration	– 14 192				81	– 14 111
Research and development	– 9 039	43	495		99	– 8 402
Other income	1 927		– 10	– 297	– 867	753
Other expense	– 2 344		205	264	816	– 1 059
The following are adjustments to arrive at core income before taxes						
Income from associated companies	703	296			135	1 134
Other financial income and expense	– 447				348	– 99

[1] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the recurring amortization of acquired rights for technology platforms; income from associated companies includes USD 296 million for the Novartis share of the estimated Roche core items

[2] Impairments: cost of goods sold and research and development include impairment charges related to intangible assets; other income includes impairment reversals of property, plant and equipment; other expense includes impairment charges related to property, plant and equipment, and financial assets

[3] Acquisition or divestment of businesses and related items, including restructuring and integration charges: other income and other expense include transitional service fee income and expenses, and other items related to the portfolio transformation; other income also includes a gain from the revaluation of a previously held financial investment in a newly acquired company

[4] Other items: other revenues include an early release of deferred income associated with a collaboration agreement; cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites; research and development, selling, general and administration, other income and other expense include other restructuring income and charges; cost of goods sold and research and development include adjustments of contingent considerations; selling, general and administration, other income and other expense include items related to setup costs for Novartis Business Services; other income and other expense also include legal settlements and changes in provisions; other income also includes gains from product divestments, other income related to the portfolio transformation, and a gain related to the sale of real estate; other expense also includes

a charge as a result of a pension plan amendment, a charge for an indirect tax settlement, and other costs; income from associated companies includes USD 135 million for the Novartis share of the estimated GSK Consumer Healthcare Holdings Ltd. core items; other financial income and expense relates mainly to devaluation losses in Venezuela

[5] Taxes on the adjustments between IFRS and core results take into account, for each individual item included in the adjustment, the tax rate that will finally be applicable to the item based on the jurisdiction where the adjustment will finally have a tax impact. Generally, this results in amortization and impairment of intangible assets and acquisition-related restructuring and integration items having a full tax impact. There is usually a tax impact on other items, although this is not always the case for items arising from legal settlements in certain jurisdictions. Adjustments related to income from associated companies are recorded net of any related tax effect. Due to these factors and the differing effective tax rates in the various jurisdictions, the tax on the total adjustments for continuing operations of USD 5.5 billion to arrive at the core results before tax amounts to USD 882 million. The average tax rate on the adjustments is 16.0%.

[6] Earnings per share (EPS) is calculated on the amount of net income attributable to shareholders of Novartis AG.

2018, 2017 and 2016 reconciliation from IFRS results to core results – Innovative Medicines

2018 (USD millions)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items [3]	Other items [4]	Core results
Gross profit	26 951	1 979	423	5	329	29 687
Operating income	7 871	2 158	827	126	169	11 151
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 9 870	1 979	423	5	329	– 7 134
The following are adjustments to arrive at core operating income						
Selling, general and administration	– 10 907			28	– 11	– 10 890
Research and development	– 7 675	179	167	23	– 34	– 7 340
Other income	977				– 671	306
Other expense	– 1 475		237	70	556	– 612

[1] Amortization of intangible assets: cost of goods sold includes amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the amortization of acquired rights, including technology platforms

[2] Impairments: cost of goods sold and research and development include impairment charges related to intangible assets; research and development also includes impairment reversals of property, plant and equipment; other expense includes impairment charges related to property, plant and equipment

[3] Acquisition or divestment of businesses and related items, including restructuring and integration charges: cost of goods sold, selling, general and administration, research and development and other expense include charges related to acquisitions; other expense also includes items related to the portfolio transformation

[4] Other items: cost of goods sold and other expense include restructuring and other charges related to the Group-wide rationalization of manufacturing sites and charges related to changes in a contractual agreement; cost of goods sold, research and development, other income and other expense include other restructuring income and charges and related items; cost of goods sold and research and development also include fair value adjustments of contingent consideration liabilities; cost of goods sold also includes an inventory write-off; selling, general and administration includes a reversal of a provision; research and development includes a charge for onerous contracts; other income and other expense include fair value adjustments on financial assets and legal-related items; other income also includes product divestment gains and releases of accruals

2017 (USD millions)	IFRS restated results [1]	Amortization of intangible assets [2]	Impairments [3]	Acquisition or divestment of businesses and related items [4]	Other items [5]	Core restated results [1]
Gross profit	25 194	1 932	31		56	27 213
Operating income	7 595	2 119	675	30	– 400	10 019

The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 8 650	1 932	31		56	– 6 631
The following are adjustments to arrive at core operating income						
Selling, general and administration	– 9 887				– 3	– 9 890
Research and development	– 7 615	187	594		– 200	– 7 034
Other income	1 027		– 9	– 2	– 665	351
Other expense	– 1 124		59	32	412	– 621

[1] Restated to reflect the product transfers between Innovative Medicines and Alcon that was effective as of January 1, 2018

[2] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the recurring amortization of acquired rights for technology platforms

[3] Impairments: cost of goods sold and research and development include impairment charges related to intangible assets; research and development, other income and other expense include reversals and charges related to the impairment of property, plant and equipment

[4] Acquisition or divestment of businesses and related items, including restructuring and integration charges: other income includes transitional service fee income; other expense includes items related to the portfolio transformation and costs related to an acquisition

[5] Other items: cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites; costs of goods sold, research and development, selling, general and administration, other income and other expense include other restructuring income and charges and related items; selling, general and administration includes an income from the release of a provision; research and development includes fair value adjustments to contingent consideration liabilities; other income and other expense include legal-related items; other income also includes a gain from a Swiss pension plan amendment, income from a settlement of a contract dispute, as well as product and financial asset divestment gains; other expense also includes a provision for contract termination costs, an amendment to the Swiss pension plan, a charge for onerous contracts, and other charges

2016 (USD millions)	IFRS restated results [1]	Amortization of intangible assets [2]	Impairments [3]	Acquisition or divestment of businesses and related items [4]	Other items [5]	Core restated results [1]
Gross profit	24 294	2 285	41		– 10	26 610
Operating income	7 255	2 316	617	– 27	– 107	10 054
The following are adjustments to arrive at core gross profit						
Other revenues	815				– 50	765
Cost of goods sold	– 8 976	2 285	41		40	– 6 610
The following are adjustments to arrive at core operating income						
Selling, general and administration	– 9 225				7	– 9 218
Research and development	– 7 696	31	481		84	– 7 100
Other income	1 091			– 68	– 759	264
Other expense	– 1 209		95	41	571	– 502

[1] Restated to reflect the product transfers between Innovative Medicines and Alcon that was effective as of January 1, 2018

[2] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the recurring amortization of acquired rights for technology platforms

[3] Impairments: cost of goods sold and research and development include impairment charges related to intangible assets; other expense includes impairment charges related to property, plant and equipment, and financial assets

[4] Acquisition or divestment of businesses and related items, including restructuring and integration charges: other income and other expense include transitional service fee income and expenses, and other items related to the portfolio transformation; other income also includes a gain from the revaluation of a previously held financial investment in a newly acquired company

[5] Other items: other revenues include an early release of deferred income associated with a collaboration agreement; cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites; research and development, selling, general and adminstration, other income and other expense include other restructuring income and charges; research and development also includes an expense due to an adjustment of a contingent consideration; other income and other expense also include legal settlements and changes in provisions; other income also includes gains from product divestments; other expense also includes a charge as a result of a pension plan amendment

2018, 2017 and 2016 reconciliation from IFRS to core results – Sandoz

2018 (USD millions)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items	Other items [3]	Core results
Gross profit	4 568	363	65		133	5 129

Operating income	1 332	363	312	– 5	2 002
The following are adjustments to arrive at core gross profit					
Cost of goods sold	– 5 530	363	65	133	– 4 969
The following are adjustments to arrive at core operating income					
Selling, general and administration	– 2 305			10	– 2 295
Other income	505			– 295	210
Other expense	– 622		247	147	– 228

[1] Amortization of intangible assets: cost of goods sold includes amortization of acquired rights to in-market products and other production-related intangible assets

[2] Impairments: cost of goods sold includes impairment charges related to intangible assets and impairment charges for currently marketed products related to a disposal group held for sale; other expense includes impairment charges related to property, plant and equipment, and goodwill impairment charges related to a disposal group held for sale

[3] Other items: cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites; cost of goods sold also includes inventory write-off and other product recall-related costs; cost of goods sold, selling, general and administration, other income and other expense include other restructuring income and charges and related items; other income also includes product divestment gains, a legal settlement gain and fair value adjustments of contingent consideration liabilities; other expense includes legal-related items and restructuring charges

2017 (USD millions)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items	Other items [3]	Core results
Gross profit	4 415	454	61		69	4 999
Operating income	1 368	454	134		124	2 080
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 5 800	454	61		69	– 5 216
The following are adjustments to arrive at core operating income						
Other income	204				– 10	194
Other expense	– 351		73		65	– 213

[1] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets

[2] Impairments: cost of goods sold includes impairment charges related to intangible assets; other expense includes impairment charges related to property, plant and equipment

[3] Other items: cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites, and other restructuring income and charges and related items; other income also includes a gain from a Swiss pension plan amendment

2016 USD millions)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items	Other items [3]	Core results
Gross profit	4 314	460	55		60	4 889
Operating income	1 445	460	66		100	2 071
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 5 971	460	55		60	– 5 396
The following are adjustments to arrive at core operating income						
Research and development	– 814		10			– 804
Other income	185		– 10		– 29	146
Other expense	– 259		11		69	– 179

[1] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets

[2] Impairments: cost of goods sold and research and development include impairment charges related to intangible assets; other income includes impairment reversals of property, plant and equipment; other expense includes

impairment charges related to property, plant and equipment

[3] Other items: cost of goods sold, other income and other expense include net restructuring and other charges related to the Group-wide rationalization of manufacturing sites, and other restructuring income and charges; other income also includes gains from product divestments; other expense also includes other costs

2018, 2017 and 2016 reconciliation of IFRS results to core results – Alcon

2018 (USD millions)	IFRS results	Amortization of intangible assets [1]	Impairments [2]	Acquisition or divestment of businesses and related items	Other items [3]	Core results
Gross profit	3 170	996	389		– 23	4 532
Operating income	– 194	1 007	391		75	1 279
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 3 983	996	389		– 23	– 2 621
The following are adjustments to arrive at core operating income						
Selling, general and administration	– 2 754		2		13	– 2 739
Research and development	– 585	11			47	– 527
Other income	58				– 23	35
Other expense	– 83				61	– 22

[1] Amortization of intangible assets: cost of goods sold includes amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the amortization of acquired rights for technology platforms

[2] Impairments: cost of goods sold and selling, general and administration includes impairment charges related to intangible assets

[3] Other items: cost of goods sold, selling, general and administration and research and development include charges and reversal of charges related to a product's voluntary market withdrawal; cost of goods sold, selling, general and administration, research and development, other income and other expense also include other restructuring income and charges and related items; research and development also includes amortization of option rights and a fair value adjustment of a contingent consideration liability; other income includes fair value adjustments on a financial asset; other expense includes legal-related items

2017 (USD millions)	IFRS restated results [1]	Amortization of intangible assets [2]	Impairments [3]	Acquisition or divestment of businesses and related items	Other items [4]	Core restated results [1]
Gross profit	3 189	1 015				4 204
Operating loss/income	– 3	1 025	86		60	1 168
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 3 588	1 015				– 2 573
The following are adjustments to arrive at core operating income						
Research and development	– 583	10	86		– 18	– 505
Other income	47				– 17	30
Other expense	– 124				95	– 29

[1] Restated to reflect the product transfers between Innovative Medicines and Alcon that was effective as of January 1, 2018

[2] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the recurring amortization of acquired rights for technology platforms

[3] Impairments: research and development includes impairment charges related to intangible and financial assets

[4] Other items: research and development includes fair value adjustments to contingent consideration liabilities; other income and other expense include restructuring income and charges and related items; other income also includes a gain from a Swiss pension plan amendment and the partial reversal of a prior period charge; other expense also includes legal-related items

2016 (USD millions)	IFRS restated results [1]	Amortization of intangible assets [2]	Impairments [3]	Acquisition or divestment of businesses and related items	Other items [4]	Core restated results [1]
Gross profit	3 100	1 013			– 14	4 099
Operating income	39	1 025	4		82	1 150
The following are adjustments to arrive at core gross profit						
Cost of goods sold	– 3 447	1 013			– 14	– 2 448
The following are adjustments to arrive at core operating income						
Research and development	– 529	12	4		15	– 498
Other income	48				– 4	44
Other expense	– 100				85	– 15

[1] Restated to reflect the product transfers between Innovative Medicines and Alcon that was effective as of January 1, 2018

[2] Amortization of intangible assets: cost of goods sold includes recurring amortization of acquired rights to in-market products and other production-related intangible assets; research and development includes the recurring amortization of acquired rights for technology platforms

[3] Impairments: research and development includes impairment charges related to intangible assets

[4] Other items: cost of goods sold includes income due to an adjustment of a contingent consideration; research and development, other income and other expense include restructuring income and charges; research and development also includes an expense due to an adjustment of a contingent consideration; other expense also includes a charge for an indirect tax settlement

2018, 2017 and 2016 reconciliation from IFRS results to core results – Corporate

2018 (USD millions)	IFRS results	Amortization of intangible assets	Impairments	Acquisition or divestment of businesses and related items [1]	Other items [2]	Core results
Gross profit	70					70
Operating loss	– 840			8	223	– 609
The following are adjustments to arrive at core operating loss						
Other income	150			– 21	– 84	45
Other expense	– 555			29	307	– 219

[1] Acquisition or divestment of businesses and related items, including restructuring and integration charges: other income and other expense include transitional service fee income and expenses, and other items related to the portfolio transformation

[2] Other items: other income and other expense include fair value adjustments and divestment gains and losses on financial assets, as well as restructuring income and charges and related items; other income also includes divestment gains on property, plant and equipment

2017 (USD millions)	IFRS results	Amortization of intangible assets	Impairments [1]	Acquisition or divestment of businesses and related items [2]	Other items [3]	Core results
Gross profit	162					162
Operating loss	– 331		197	15	– 298	– 417
The following are adjustments to arrive at core operating loss						
Other income	691			– 115	– 373	203
Other expense	– 732		197	130	75	– 330

[1] Impairments: other expense includes impairment charges related to financial assets
[2] Acquisition or divestment of businesses and related items, including restructuring and integration charges: other income and other expense include transitional service fee income and expenses, and other items related to the portfolio transformation
[3] Other items: other income includes a fair value adjustment to contingent consideration sales milestone receivables, a Swiss pension plan amendment and other items; other income and other expense include restructuring income and charges and related items; other expense also includes an amendment to the Swiss pension plan

2016 (USD millions)	IFRS results	Amortization of intangible assets	Impairments [1]	Acquisition or divestment of businesses and related items [2]	Other items [3]	Core results
Gross profit	208					208
Operating loss	– 471		99	– 6	90	– 288
The following are adjustments to arrive at core operating loss						
Selling, general and administration	– 506				74	– 432
Other income	603			– 229	– 75	299
Other expense	– 776		99	223	91	– 363

[1] Impairments: other expense includes impairment charges related to financial assets
[2] Acquisition or divestment of businesses and related items, including restructuring and integration charges: other income and other expense include transitional service fee income and expenses, and other items related to the portfolio transformation
[3] Other items: selling, general and administration, other income and other expense include items related to setup costs for Novartis Business Services; other income also includes income related to the portfolio transformation and a gain related to the sale of real estate; other expense also includes other restructuring charges and other costs
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5.B Liquidity and capital resources

The following tables summarize the Group's cash flow and net debt.

(USD millions)	2018	2017	2016
Net cash flows from operating activities	14 272	12 621	11 475
Net cash flows used in investing activities	– 5 591	– 2 979	– 2 693
Net cash flows used in investing activities from discontinued operations		– 140	– 748
Net cash flows used in financing activities	– 4 244	– 7 733	– 5 314
Effect of exchange rate changes on cash and cash equivalents	– 26	84	– 387
Net change in cash and cash equivalents	4 411	1 853	2 333
Change in marketable securities, commodities, time deposits and derivative financial instruments	2 068	– 145	– 3
Change in current and non-current financial debts and derivative financial instruments	– 3 616	– 4 730	– 1 871
Change in net debt	2 863	– 3 022	459
Net debt at January 1	– 19 047	– 16 025	– 16 484
Net debt at December 31	– 16 184	– 19 047	– 16 025

Cash flow

Financial year 2018

Net cash flows from operating activities amounted to USD 14.3 billion, compared to USD 12.6 billion in 2017. The increase was mainly driven by higher net income adjusted for non-cash items and other adjustments, including divestment gains, as well as favorable hedging results and working capital, which includes the receipt of a GSK sales milestone from the divested Vaccines business.

Net cash flows used in investing activities amounted to USD 5.6 billion, compared to USD 3.1 billion in 2017. The current year includes cash inflows of USD 13.0 billion from the divestment of our 36.5% stake in the GSK consumer healthcare joint venture and of USD 1.1 billion for the proceeds from sales of property, plant and equipment, intangible and financial assets. This was offset by cash outflows for the acquisitions of businesses of USD 13.9 billion, mainly Advanced Accelerator Applications S.A. of USD 3.5 billion, net (USD 3.9 billion, net of cash acquired USD 0.4 billion), AveXis, Inc. of USD 8.3 billion, net (USD 8.7 billion, net of cash acquired USD 0.4 billion) and Endocyte, Inc. of USD 1.8 billion, net (USD 2.1 billion, net of cash acquired USD 0.3 billion), as well as for the purchase of property, plant and equipment of USD 1.8 billion and for the purchase of intangible assets of USD 1.6 billion. Net purchases of marketable securities and commodities amounted to USD 2.0 billion.

Net cash flows used in financing activities amounted to USD 4.2 billion, compared to USD 7.7 billion in 2017. The current year mainly includes the cash outflows for the dividend payment of USD 7.0 billion and for net treasury share transactions of USD 1.3 billion, partly offset by a net increase in current and non-current financial debt of USD 4.2 billion. This increase was mainly from the issuance of euro bonds totaling USD 2.8 billion (notional amount EUR 2.25 billion) and the net increase in current financial debts of USD 1.7 billion, partly offset by repayments of non-current financial debts of USD 0.4 billion.

Financial year 2017

Net cash flows from operating activities amounted to USD 12.6 billion, compared to USD 11.5 billion in 2016. The increase of USD 1.1 billion was mainly driven by favorable working capital changes, lower legal settlement payments out of provisions, and lower taxes paid, partly offset by the decrease in net income adjusted for non-cash items and other adjustments.

Net cash flows used in investing activities from continuing operations amounted to USD 3.0 billion in 2017. This amount included cash outflows for the purchase of property, plant and equipment of USD 1.7 billion, intangible assets of USD 1.1 billion, and financial assets and other non-current assets of USD 0.5 billion; and for acquisitions and divestments of businesses, net (including the Ziarco Group Limited and Encore Vision, Inc. acquisitions) of USD 0.8 billion. This was partly offset by cash inflows from the sale of property, plant and equipment; intangible assets; and financial assets of USD 1.1 billion.

Net cash flows used in investing activities from discontinued operations, which consists of payments out of provisions related to the portfolio transformation transactions, amounted to USD 0.1 billion, compared to USD 0.7 billion in

2016, which also included capital gains taxes.

The net cash flows used in financing activities amounted to USD 7.7 billion, compared to USD 5.3 billion in 2016. The 2017 amount included mainly cash outflows for the dividend payment of USD 6.5 billion and for net treasury share transactions of USD 5.2 billion. The net cash inflows from current and non-current financial debts of USD 4.0 billion were mainly from the issuance of bonds denominated in US dollar and euro for a notional amount of USD 3.0 billion and EUR 1.85 billion (USD 2.0 billion), respectively, partially offset by the repayment of current and non-current financial debt of USD 0.9 billion.

Financial year 2016

Net cash flows from operating activities from continuing operations amounted to USD 11.5 billion, compared to USD 12.1 billion in 2015. The decrease of USD 0.6 billion was driven by lower operating income adjusted for non-cash items and other adjustments, lower hedging results and higher payments out of provisions, partially offset by dividends received from GSK Consumer Healthcare Holdings Ltd., lower cash outflows for taxes paid, and net current assets and other operating cash flow items.

Net cash flows used in investing activities from continuing operations amounted to USD 2.7 billion in 2016. This amount includes cash outflows of USD 1.9 billion for the purchase of property, plant and equipment; USD 1.4 billion for intangible, financial and other non-current assets; and USD 0.8 billion for acquisitions and divestments of businesses, net (including the Transcend Medical, Inc. and Reprixys Pharmaceuticals Corporation acquisitions). This was offset by cash inflows of USD 1.3 billion of proceeds from the sale of non-current assets, and USD 0.1 billion net proceeds from the sales of marketable securities and commodities. In 2015, cash flows used in investing activities from continuing operations amounted to USD 19.7 billion, primarily due to the acquisition of the GSK oncology assets for USD 16.0 billion.

Net cash flows used in investing activities from discontinued operations amounted to USD 0.7 billion in 2016 due to portfolio transformation transactions payments, including capital gains taxes. In 2015, the cash flows from investing activities from discontinued operations of USD 8.9 billion were mainly driven by net proceeds from the portfolio transformation divestments.

The net cash flows used in financing activities amounted to USD 5.3 billion, compared to USD 9.2 billion in 2015. The 2016 amount includes cash outflows of USD 6.5 billion for the dividend payment and USD 0.9 billion for treasury share transactions, net. The net inflow of USD 2.1 billion from current and non-current financial debts was due to the increase in short-term borrowings of USD 1.8 billion and the issuance of two euro-denominated bonds for total proceeds of USD 1.9 billion, partially offset by the repayment at maturity of a euro-denominated bond of USD 1.7 billion.

The 2015 amount included mainly a cash outflow of USD 6.6 billion for the dividend payment, and USD 4.5 billion for treasury share transactions, net, partially offset by a net inflow from financial debts of USD 2.0 billion.

Group net debt

Net debt constitutes a non-IFRS financial measure, which means that it should not be interpreted as a measure determined under International Financial Reporting Standards (IFRS). Net debt/liquidity is presented as additional information, as it is a useful indicator of the Group’s ability to meet financial commitments and to invest in new strategic opportunities, including strengthening its balance sheet.

Group net debt consists of:

(USD millions)	2018	2017	Change
Non-current financial debts	– 22 470	– 23 224	754
Current financial debts and derivative financial instruments	– 9 678	– 5 308	– 4 370
Total financial debt	– 32 148	– 28 532	– 3 616
Less liquidity			
Cash and cash equivalents	13 271	8 860	4 411
Marketable securities, commodities, time deposits and derivative financial instruments	2 693	625	2 068
Total liquidity	15 964	9 485	6 479
Net debt at December 31	– 16 184	– 19 047	2 863

Financial year 2018

Group net debt at December 31, 2018, decreased to USD 16.2 billion, compared to USD 19.0 billion at December 31, 2017.

Total financial debt increased by USD 3.6 billion to USD 32.1 billion at December 31, 2018, from USD 28.5 billion at December 31, 2017. Non-current financial debt decreased by USD 0.8 billion to USD 22.5 billion at December 31, 2018, from USD 23.2 billion at December 2017, mainly driven by foreign exchange translation adjustments, as the issuance of euro bonds totaling USD 2.8 billion (notional amount EUR 2.25 billion) was offset by the reclassification of a US dollar bond of USD 3.0 billion, which becomes due in 2019, to current financial debt.

Current financial debts and derivative financial instruments increased by USD 4.4 billion to USD 9.7 billion at December 31, 2018, from USD 5.3 billion at December 31, 2017, mainly due to higher net short-term borrowings and the reclassification of a US dollar bond of USD 3.0

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billion from non-current liabilities, which becomes due in 2019.

Novartis has two US commercial paper programs under which it can issue up to USD 9.0 billion in the aggregate of unsecured commercial paper notes. Novartis also has a Japanese commercial paper program under which it can issue up to JPY 150 billion (approximately USD 1.4 billion) of unsecured commercial paper notes. Commercial paper notes totaling USD 4.0 billion under these three programs were outstanding as per December 31, 2018 (2017: USD 2.3 billion). Novartis further has a committed credit facility of USD 6.0 billion, entered into on September 23, 2015. This credit facility is provided by a syndicate of banks and is intended to be used as a backstop for the United States commercial paper programs. It matures in September 2020 and was undrawn as per December 31, 2018 and December 31, 2017.

As of year-end 2018, Moody’s Investor Service rated the Company A1 for long-term maturities and P-1 for short-term maturities and S&P Global Ratings AA- for long-term maturities and A-1+ for short-term maturities.

Financial year 2017

Group net debt at December 31, 2017, increased to USD 19.0 billion compared to USD 16.0 billion at the end of 2016, mainly due to increased borrowings.

Total financial debt increased by USD 4.7 billion to USD 28.5 billion at December 31, 2017, from USD 23.8 billion at December 31, 2016. Non-current financial debt increased by USD 5.3 billion to USD 23.2 billion at December 31, 2017, from USD 17.9 billion at December 2016, mainly due to the issuance of bonds in the first quarter that are denominated in US dollar and euro for a notional amount of USD 3.0 billion and EUR 1.85 billion (USD 2.0 billion), respectively.

Current financial debt decreased by USD 0.6 billion to USD 5.3 billion at December 31, 2017, from USD 5.9 billion at December 31, 2016, mainly due to a reduction in short term borrowings. Overall current financial debt consists of the current portion of non-current financial debt of USD 0.4 billion and other short term borrowings of USD 4.9 billion, including derivatives and commercial paper.

Novartis has two US commercial paper programs under which it can issue up to USD 9.0 billion in the aggregate of unsecured commercial paper notes. Novartis also has a Japanese commercial paper program under which it can issue up to JPY 150 billion (approximately USD 1.3 billion) of unsecured commercial paper notes. Commercial paper notes totaling USD 2.3 billion under these three programs were outstanding as per December 31, 2017. Novartis further has a committed credit facility of USD 6.0 billion, entered into on September 23, 2015. This credit facility is provided by a syndicate of banks and is intended to be used as a backstop for the US commercial paper programs. It matures in September 2020 and was undrawn as per December 31, 2017.

As of year-end 2017, Moody’s Investor Service rated the Company Aa3 for long-term maturities and P-1 for short-term maturities and S&P Global Ratings AA- for long-term maturities and A-1+ for short-term maturities.

The maturity schedule of our net debt is as follows:

	2018					
(USD millions)	Due within one month	Due later than one month but less than three months	Due later than three months but less than one year	Due later than one year but less than five years	Due after five years	Total
Current assets						
Marketable securities, time deposits and short-term investments with original maturity more than 90 days	39	56	2 091	198	63	2 447
Commodities					104	104
Derivative financial instruments and accrued interest	40	75	27			142
Cash and cash equivalents	3 571	9 700				13 271
Total current financial assets	3 650	9 831	2 118	198	167	15 964

Non-current liabilities					
Financial debt				– 8 980	– 13 490 – 22 470
Financial debt - undiscounted				– 9 025	– 13 623 – 22 648
Total non-current financial debt				– 8 980	– 13 490 – 22 470
Current liabilities					
Financial debt	– 5 217	– 4 084	– 319		– 9 620
Financial debt - undiscounted	– 5 217	– 4 084	– 319		– 9 620
Derivative financial instruments	– 16	– 34	– 8		– 58
Total current financial debt	– 5 233	– 4 118	– 327		– 9 678
Net debt	– 1 583	5 713	1 791	– 8 782	– 13 323 – 16 184

	2017					
(USD millions)	Due within one month	Due later than one month but less than three months	Due later than three months but less than one year	Due later than one year but less than five years	Due after five years	Total
Current assets						
Marketable securities and time deposits	71	72	105	181	58	487
Commodities					106	106
Derivative financial instruments and accrued interest	7	19	6			32
Cash and cash equivalents	4 260	4 600				8 860
Total current financial assets	4 338	4 691	111	181	164	9 485
Non-current liabilities						
Financial debt				– 9 849	– 13 375	– 23 224
Financial debt - undiscounted				– 9 893	– 13 519	– 23 412
Total non-current financial debt				– 9 849	– 13 375	– 23 224
Current liabilities						
Financial debt	– 4 576	– 169	– 456			– 5 201
Financial debt - undiscounted	– 4 576	– 169	– 456			– 5 201
Derivative financial instruments	– 31	– 48	– 28			– 107
Total current financial debt	– 4 607	– 217	– 484			– 5 308
Net debt	– 269	4 474	– 373	– 9 668	– 13 211	– 19 047

The following table provides a breakdown of liquidity and financial debt by currency as of December 31:

Liquidity and financial debt by currency

	Liquidity in % 2018 [1]	Liquidity in % 2017 [1]	Liquidity in % 2016 [1]	Financial debt in % 2018 [2]	Financial debt in % 2017 [2]	Financial debt in % 2016 [2]
USD	83	77	77	60	63	66
EUR	6	8	9	25	20	13
CHF	7	5	5	10	11	13
JPY		1		3	4	5
Other	4	9	9	2	2	3
	100	100	100	100	100	100

[1] Liquidity includes cash and cash equivalents, marketable securities, commodities and time deposits.

[2] Financial debt includes non-current and current financial debt.

Effects of currency fluctuations

We transact our business in many currencies other than the US dollar, our reporting currency.

The following provides an overview of net sales and operating expenses for our operations based on IFRS values for 2018, 2017 and 2016, for currencies most important to the Group:

	2018		2017		2016	
Currency	Net sales %	Operating expenses %	Net sales %	Operating expenses %	Net sales %	Operating expenses %
US dollar (USD)	37	37	37	42	38	43
Euro (EUR)	27	24	26	22	26	23
Swiss franc (CHF)	2	17	2	15	2	15
Japanese yen (JPY)	6	3	6	4	7	5
Chinese yuan (CNY)	5	3	4	3	4	3
British pound (GBP)	2	2	2	2	3	2
Canadian dollar (CAD)	3	2	3	1	3	1
Brazilian real (BRL)	2	1	2	1	2	1
Australian dollar (AUD)	2	1	2	1	2	1
Russian ruble (RUB)	2	1	2	1	1	1
Other currencies	12	9	14	8	12	5

Operating expenses in the above table include cost of goods sold, selling, general and administration, research and development, other income and other expense.

We prepare our consolidated financial statements in US dollars. As a result, fluctuations in the exchange rates between the US dollar and other currencies can have a significant effect on both the Group's results of operations as well as the reported value of our assets, liabilities and cash flows. This in turn may significantly affect reported earnings (both positively and negatively) and the comparability of period-to-period results of operations.

For purposes of our consolidated balance sheets, we translate assets and liabilities denominated in other currencies into US dollars at the prevailing market exchange rates as of the relevant balance sheet date. For purposes of the Group's consolidated income and cash flow statements, revenue, expense and cash flow items in local currencies are translated into US dollars at average exchange rates prevailing during the relevant period. As a result, even if the amounts or values of these items remain unchanged in the respective local currency, changes in exchange rates have an impact on the amounts or values of these items in our consolidated financial statements.

Because our expenditures in Swiss francs are significantly higher than our revenues in Swiss francs, volatility in the value of the Swiss franc can have a significant impact on the reported value of our earnings, assets and liabilities, and

the timing and extent of such volatility can be difficult to predict. In addition, there is a risk that certain countries could take steps that could significantly impact the value of their currencies.

There is also a risk that certain countries could devalue their currency. If this occurs, it could impact the effective prices we would be able to charge for our products and also have an adverse impact on both our consolidated income statement and balance sheet.

The Group is exposed to a potential adverse devaluation risk on its intercompany funding and total investment in certain subsidiaries operating in countries with exchange controls. The most significant country in this respect was Venezuela, where the Group incurred significant foreign exchange losses in 2015 and 2016.

Since November 2016, the Group has applied the floating rate of DICOM (Sistema de Divisa Complementaria) to translate the financial statements of its Venezuelan subsidiaries. In 2016, this resulted in a USD 0.3 billion revaluation loss on the outstanding intercompany balances, which was recorded in the income statement of the year 2016. In August 2018, Venezuela introduced a new currency Bolivar Soberano (VES), replacing the former currency Bolivar Fuerte (VEF) at a rate of 1 VES for 100 000 VEF. The net outstanding intercompany payable balance of Venezuela subsidiaries was not significant at December 31, 2018, and at December 31, 2017, due to reserves against the intercompany balances.

Subsidiaries whose functional currencies have experienced a cumulative inflation rate of more than 100% over the past three years apply the rules of IAS 29 “Financial Reporting in Hyperinflationary Economies.” Gains and losses incurred upon adjusting the carrying amounts of non-monetary assets and liabilities for inflation are recognized in the income statement. The hyperinflationary economies in which Novartis operates are Venezuela and Argentina. Venezuela was hyperinflationary for all years presented and Argentina became hyperinflationary effective July 1, 2018, requiring retroactive implementation of hyperinflation accounting as of January 1, 2018. The impacts from applying IAS 29 are not significant.

The Group manages its global currency exposure by engaging in hedging transactions where management deems appropriate, after taking into account the natural hedging afforded by our global business activity. For 2018, we entered into various contracts that change in value with movements in foreign exchange rates to preserve the value of assets, commitments and expected transactions. We use forward contracts and foreign currency options to hedge. For more information on how these transactions affect our consolidated financial statements and on how foreign exchange rate exposure is managed, see “Item 18. Financial Statements—Note 1. Significant accounting policies,” “Item 18. Financial Statements—Note 5. Interest expense and other financial income and expense,” “Item 18. Financial Statements—Note 14. Trade receivables,” and “Item 18. Financial Statements—Note 27. Commitments and contingencies” and “Item 18. Financial Statements—Note 28. Financial instruments – additional disclosures.”

The following table sets forth the foreign exchange rates of the US dollar against key currencies used for foreign currency translation when preparing the Group’s consolidated financial statements:

	Average for year			Year-end		
USD per unit	2018	2017	Change in %	2018	2017	Change in %
Australian dollar (AUD)	0.748	0.766	– 2	0.707	0.779	– 9
Brazilian real (BRL)	0.275	0.313	– 12	0.258	0.302	– 15
Canadian dollar (CAD)	0.772	0.771	0	0.735	0.797	– 8
Swiss franc (CHF)	1.023	1.016	1	1.014	1.024	– 1
Chinese yuan (CNY)	0.151	0.148	2	0.145	0.154	– 6
Euro (EUR)	1.181	1.129	5	1.144	1.195	– 4
British pound (GBP)	1.336	1.288	4	1.274	1.347	– 5
Japanese yen (JPY (100))	0.906	0.892	2	0.907	0.888	2
Russian ruble (RUB (100))	1.600	1.715	– 7	1.437	1.734	– 17

	Average for year			Year-end		
USD per unit	2017	2016	Change in %	2017	2016	Change in %
Australian dollar (AUD)	0.766	0.744	3	0.779	0.722	8
Brazilian real (BRL)	0.313	0.288	9	0.302	0.307	– 2
Canadian dollar (CAD)	0.771	0.755	2	0.797	0.741	8
Swiss franc (CHF)	1.016	1.015	0	1.024	0.978	5

Chinese yuan (CNY)	0.148	0.151	– 2	0.154	0.144	7
Euro (EUR)	1.129	1.107	2	1.195	1.051	14
British pound (GBP)	1.288	1.355	– 5	1.347	1.227	10
Japanese yen (JPY (100))	0.892	0.922	– 3	0.888	0.854	4
Russian ruble (RUB (100))	1.715	1.498	14	1.734	1.648	5

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The following table provides a summary of the currency impact on key Group figures due to their conversion into USD, the Group's reporting currency, of the financial data from entities reporting in non US dollars. Constant currency (cc) calculations apply the exchange rates of the prior year to the current year financial data for entities reporting in non US dollars.

Currency impact on key figures

	Change in constant currencies % 2018	Change in USD % 2018	Percentage point currency impact 2018	Change in constant currencies % 2017	Change in USD % 2017	Percentage point currency impact 2017
Net sales	5	6	1	2	1	– 1
Operating income	– 5	– 5	0	7	4	– 3
Net income	64	64	0	12	15	3
Core operating income	8	8	0	0	– 1	– 1
Core net income	5	5	0	2	1	– 1

For additional information on the effects of currency fluctuations, see "Item 18. Financial Statements—Note 28. Financial instruments – additional disclosures."

Free cash flow

Novartis defines free cash flow as net cash flows from operating activities and cash flows associated with the purchase or sale of property, plant and equipment, as well as intangible, other non-current assets and financial assets, excluding marketable securities. Cash flows in connection with the acquisition or divestment of subsidiaries, associated companies and non-controlling interests in subsidiaries are not taken into account to determine free cash flow. For further information about the free cash flow measure, which is a non-IFRS measure, see "Item 5. Operating and Financial Review and Prospects—Item 5.A Operating results—Non-IFRS measures as defined by Novartis—Free cash flow" above. The following is a summary of the free cash flow:

(USD millions)	2018	2017	2016
Operating income	8 169	8 629	8 268
Adjustments for non-cash items			
Depreciation, amortization and impairments	6 881	6 332	6 175
Change in provisions and other non-current liabilities	876	160	956
Other	– 141	– 360	– 264
Operating income adjusted for non-cash items	15 785	14 761	15 135
Dividends received from associated companies and others	719	987	899
Interest and other financial receipts	461	97	43
Interest and other financial payments	– 858	– 980	– 878
Taxes paid	– 1 670	– 1 611	– 2 111
Payments out of provisions and other net cash movements in non-current liabilities	– 664	– 877	– 1 536
Change in inventory and trade receivables less trade payables	– 793	– 393	– 1 051
Change in other net current assets and other operating cash flow items	1 292	637	974
Net cash flows from operating activities	14 272	12 621	11 475
Purchase of property, plant and equipment	– 1 773	– 1 696	– 1 862
Proceeds from sales of property, plant and equipment	102	92	161
Purchase of intangible assets	– 1 582	– 1 050	– 1 017
Proceeds from sales of intangible assets	823	640	847
Purchase of financial assets	– 262	– 468	– 247
Proceeds from sales of financial assets	167	330	247
Purchase of other non-current assets	– 39	– 42	– 149
Proceeds from sales of other non-current assets	9	1	
Free cash flow	11 717	10 428	9 455

Financial year 2018

Free cash flow amounted to USD 11.7 billion (+12% USD) compared to USD 10.4 billion in 2017 as higher cash flows from operating activities, which includes the receipt of a GSK sales milestone from the divested Vaccines business, were partly offset by higher net investments in intangible assets.

Financial year 2017

Free cash flow amounted to USD 10.4 billion (+10% USD), compared to USD 9.5 billion in 2016. The increase was mainly driven by favorable working capital changes, lower legal settlement payments out of provisions, and lower taxes paid, partly offset by the decrease in operating income adjusted for non-cash items and higher net investments.

Financial year 2016

In 2016, free cash flow from continuing operations amounted to USD 9.5 billion (+2% USD), compared to USD 9.3 billion in 2015. The increase of USD 0.2 billion was mainly driven by lower net investments in property, plant and equipment.

Free cash flow for the total Group amounted to USD 9.5 billion in 2016, compared to USD 9.0 billion in 2015. The prior year included a negative free cash flow of approximately USD 0.3 billion from discontinued operations.

Condensed consolidated balance sheets

(USD millions)	Dec 31, 2018	Dec 31, 2017	Change
Assets			
Property, plant and equipment	15 696	16 464	– 768
Goodwill	35 294	31 750	3 544
Intangible assets other than goodwill	38 719	29 997	8 722
Financial and other non-current assets	20 291	26 660	– 6 369
Total non-current assets	110 000	104 871	5 129
Inventories	6 956	6 867	89
Trade receivables	8 727	8 600	127
Other current assets	3 109	3 256	– 147
Cash, marketable securities, commodities, time deposits and derivative financial instruments	15 964	9 485	6 479
Total current assets without disposal group	34 756	28 208	6 548
Assets of disposal group held for sale	807		807
Total current assets	35 563	28 208	7 355
Total assets	145 563	133 079	12 484
Equity and liabilities			
Total equity	78 692	74 227	4 465
Financial debts	22 470	23 224	– 754
Other non-current liabilities	14 794	12 225	2 569
Total non-current liabilities	37 264	35 449	1 815
Trade payables	5 556	5 169	387
Financial debts and derivatives	9 678	5 308	4 370
Other current liabilities	14 322	12 926	1 396
Total current liabilities without disposal group	29 556	23 403	6 153
Liabilities of disposal group held for sale	51		51
Total current liabilities	29 607	23 403	6 204
Total liabilities	66 871	58 852	8 019
Total equity and liabilities	145 563	133 079	12 484

Total non-current assets of USD 110.0 billion at December 31, 2018, increased by USD 5.1 billion compared to December 31, 2017.

Property, plant and equipment decreased by USD 0.8 billion to USD 15.7 billion, mainly due to unfavorable currency translation adjustments and depreciation and impairments, which more than offset net additions.

Goodwill increased by USD 3.5 billion to USD 35.3 billion, and intangible assets other than goodwill increased by USD 8.7 billion to USD 38.7 billion. These increases were mainly due to the acquisitions of Advanced Accelerator

Applications S.A., AveXis, Inc. and Endocyte, Inc.

Financial and other non-current assets decreased by USD 6.4 billion to USD 20.3 billion, mainly due to the divestment of the 36.5% stake in the GSK consumer healthcare joint venture to GSK in 2018, partially offset by an increase in deferred tax assets from acquisitions.

Total current assets of USD 35.6 billion at December 31, 2018 increased by USD 7.4 billion, compared to December 31, 2017, mainly due to an increase in cash and cash equivalents of USD 4.4 billion and marketable

securities, commodities, time deposits and derivative financial instruments of USD 2.1 billion. Trade receivables increased slightly by USD 0.1 billion to USD 8.7 billion whereas inventories and income tax receivables remained flat compared to the previous year end. This was offset by a decrease in other current assets of USD 0.1 billion.

Assets of disposal group held for sale of USD 0.8 billion include net assets related to the pending divestment of the Sandoz US dermatology business and generic US oral solids portfolio to Aurobindo Pharma USA Inc., as announced on September 6, 2018 (see "item 18. Financial Statements – Note 2 Significant pending transactions).

We consider that our provisions for doubtful trade receivables are adequate. We continue to monitor the level of trade receivables, particularly in Greece, Italy, Portugal, Spain, Brazil, Russia, Saudi Arabia, Turkey and Argentina, which has been included in 2018. Should there be a substantial deterioration in our economic exposure with respect to those countries, we may change the terms of trade on which we operate.

The gross trade receivables from these countries at December 31, 2018 amount to USD 1.7 billion (2017: USD 1.7 billion), of which USD 97 million is past due for more than one year (2017: USD 124 million), and for which provisions of USD 44 million have been recorded (2017: USD 95 million). At December 31, 2018, amounts past due for more than one year are not significant in any of these countries on a standalone basis. The majority of the outstanding trade receivables from Greece, Portugal, Saudi Arabia and Spain are due directly from local governments or government-funded entities.

The following table provides an overview of the aging analysis of total trade receivables and the total amount of the provision for doubtful trade receivables as of December 31, 2018 and 2017:

(USD millions)	2018	2017
Not overdue	7 916	7 758
Past due for not more than one month	296	279
Past due for more than one month but less than three months	194	230
Past due for more than three months but less than six months	136	137
Past due for more than six months but less than one year	98	137
Past due for more than one year	213	249
Provisions for doubtful trade receivables	– 126	– 190
Total trade receivables, net	8 727	8 600

There is also a risk that certain countries could devalue their currency. Currency exposures are described in more detail in "—Effects of currency fluctuations" above.

Total non-current liabilities of USD 37.3 billion at December 31, 2018, increased by USD 1.8 billion compared to December 31, 2017.

Long-term financial debts decreased by USD 0.8 billion to USD 22.5 billion, mainly driven by foreign exchange translation adjustments, as the issuance of a euro bond of USD 2.8 billion (notional amount EUR 2.25 billion) was offset by the reclassification from non-current to current financial debts of a US dollar bond of USD 3.0 billion.

Other non-current liabilities increased by USD 2.6 billion to USD 14.8 billion. This includes deferred tax liabilities, which increased by USD 2.3 billion to USD 7.5 billion, mainly due to the acquisitions of Advanced Accelerator Applications S.A., AveXis, Inc. and Endocyte, Inc., and provisions and other non-current liabilities, which increased by USD 0.3 billion to USD 7.3 billion, mainly due to an increase of the pension liabilities of USD 0.4 billion, mainly resulting from actuarial losses.

Novartis believes that its total provisions are adequate based upon currently available information. However, given the inherent difficulties in estimating liabilities in this area, Novartis may incur additional costs beyond the amounts provided. Management believes that such additional amounts, if any, would not be material to the Group's financial condition but could be material to the results of operations or cash flows in a given period.

Total current liabilities of USD 29.6 billion at December 31, 2018 increased by USD 6.2 billion compared to December 31, 2017. Trade payables of USD 5.6 billion increased slightly by USD 0.4 billion. Current financial debts and derivatives of USD 9.7 billion increased by USD 4.4 billion, due to higher net short-term borrowings and the reclassification of the US dollar bond of USD 3.0 billion from non-current to current financial debts. Other current liabilities of USD 14.3 billion include current income tax liabilities of USD 2.0 billion, which increased by USD 0.3 billion compared to December 31, 2017, and provisions and other current liabilities of USD 12.3 billion, which increased by USD 1.1 billion compared to December 31, 2017, mainly on account of accruals for revenue deductions and restructuring provisions.

In our key countries, Switzerland and the United States, assessments have been agreed by the tax authorities up to 2014 in Switzerland and up to 2012 in the United States, with the exception of one open United States position related to the 2007 tax filing. In addition, a subsidiary in France, acquired with the AAA acquisition, has an open position related to the tax years 2014 and 2015.

The Group's equity of USD 78.7 billion at December 31, 2018, increased by USD 4.5 billion compared to USD 74.2 billion at December 31, 2017. The increase was mainly due to net income of USD 12.6 billion, partially offset by the dividend payment of USD 7.0 billion. The increase in equity from the exercise of options and employee transactions, equity-based compensation and sale of treasury shares of USD 1.5 billion was more than offset by the net purchase of treasury shares of USD 2.0 billion. Treasury share repurchase obligation under a share buyback trading plan decreased equity by USD 0.3 billion.

The net debt decreased to USD 16.2 billion at December 31, 2018, compared to USD 19.0 billion at December 31, 2017 .

The Group's liquidity amounted to USD 16.0 billion at December 31, 2018, compared to USD 9.5 billion at December 31, 2017, and total non-current and current financial debt, including derivatives, amounted to USD 32.1 billion at December 31, 2018, compared to USD 28.5 billion at December 31, 2017. The debt/equity ratio increased to 0.41:1 at December 31, 2018, compared to 0.38:1 at December 31, 2017.

Summary of equity movements attributable to Novartis AG shareholders

	Number of outstanding shares (in millions)			Issued share capital and reserves attributable to Novartis AG shareholders		
	2018	2017	Change	2018 USD millions	2017 USD millions	Change USD millions
Balance at beginning of year	2 317.5	2 374.1	– 56.6	74 168	74 832	– 664
Impact of change in accounting policy [1]				60		60
Restated equity at January 1, 2018				74 228	74 832	– 604
Shares acquired to be canceled	– 23.3	– 66.2	42.9	– 1 859	– 5 270	3 411
Other share purchases	– 1.2	– 3.8	2.6	– 114	– 304	190
Exercise of options and employee transactions	7.8	4.6	3.2	434	255	179
Other share sales	3.0		3.0	263		263
Equity-based compensation	7.4	8.8	– 1.4	756	612	144
Increase of treasury share repurchase obligation under a share buyback trading plan				– 284		– 284
Transaction costs [2]				– 79		– 79
Dividends				– 6 966	– 6 495	– 471
Net income of the year attributable to shareholders of Novartis AG				12 611	7 703	4 908
Impact of change in ownership of consolidated entities				– 13		– 13
Other comprehensive income attributable to shareholders of Novartis AG				– 401	2 835	– 3 236
Other movements [3]				38		38
Balance at end of year	2 311.2	2 317.5	– 6.3	78 614	74 168	4 446

[1] The impact of change in accounting policy includes USD 60 million relating to IFRS 15 implementation and USD 177 million relating to IFRS 9 implementation. (See “Item 18. Financial Statements—Note 1. Significant accounting policies; and Note 29. Impacts of adoption of new IFRS standards.")

[2] Transaction costs directly attributable to the potential distribution (spin-off) of Alcon to Novartis shareholders. (See “Item 18. Financial Statements—Note 1. Significant accounting policies")

[3] Impact of hyperinflationary economies. (See “Item 18. Financial Statements—Note 1. Significant accounting policies")

In 2018, Novartis repurchased a total of 23.3 million shares for USD 1.9 billion on the SIX Swiss Exchange second trading line under the CHF 10 billion share buyback authority approved at the 2016 Annual General Meeting. This included 9.3 million shares (USD 0.8 billion) under the new up-to USD 5 billion share buyback announced in June 2018 and 14.0 million shares (USD 1.1 billion) to offset the dilutive impact from equity-based participation plans of associates (2017: 66.2 million shares for USD 5.3 billion, including 56.4 million shares bought for USD 4.5 billion under the up to USD 5.0 billion share buyback announced in January 2017, and 9.8 million shares bought for USD 0.8 billion to offset the dilutive impact from equity-based participation plans). In addition, 1.2 million shares for USD 0.1 billion were acquired from employees, which were previously granted to them under the respective programs (2017: 3.8 million for USD 0.3 billion). In 2018, 15.2 million treasury shares for USD 1.2 billion were delivered as a result of options being exercised and physical share deliveries related to equity-based participation plans (2017: 13.4 million shares for USD 0.9 billion). Other share sales for USD 0.3 billion resulted in an increase of 3.0 million shares outstanding (2017: nil). With these transactions, the total number of shares outstanding decreased by 6.3 million shares in 2018 (2017: decrease of 56.6 million shares). These treasury share transactions resulted in an equity decrease of USD 0.5 billion and a net cash outflow of USD 1.3 billion.

Treasury shares

At December 31, 2018, our holding of treasury shares amounted to 239.5 million shares, or approximately 10% of the total number of issued shares. Approximately 122 million treasury shares were held in entities that limit their availability for use.

At December 31, 2017, our holding of treasury shares amounted to 299.4 million shares, or approximately 10% of the total number of issued shares. Approximately 131 million treasury shares were held in entities that limit their availability for use.

At December 31, 2016, our holding of treasury shares amounted to 253.1 million shares, or approximately 10% of the total number of issued shares. Approximately 135 million treasury shares were held in entities that limit their availability for use.

Bonds

In February 2018, three euro bonds totaling EUR 2.25 billion were issued: a 5.5 year bond of EUR 750 million with a coupon of 0.5%, a 12.5 year bond of EUR 750 million with a coupon of 1.375% and a 20.5 year bond of EUR 750 million with a coupon of 1.7%.

In February 2017, three US dollar bonds totaling USD 3.0 billion were issued; a 3 year bond of USD 1.0 billion with a coupon of 1.80%, a 5 year bond of USD 1.0 billion with a coupon of 2.40% and a 10 year bond of USD 1.0 billion with a coupon of 3.10%.

In March 2017, two EUR bonds totaling EUR 1.85 billion were issued; a 4 year bond of EUR 1.25 billion with a coupon of 0% and a 10 year bond of EUR 0.6 billion with a coupon of 1.125%.

In September 2016, two EUR bonds totaling EUR 1.75 billion were issued; a 7 year bond of EUR 1.25 billion with a coupon of 0.125% and a 12 year bond of EUR 0.5 billion with a coupon of 0.625%.
In June 2016, a EUR bond of EUR 1.5 billion with a coupon of 4.25% was repaid at maturity.
Liquidity/short-term funding
We continuously track our liquidity position and asset/liability profile. This involves modeling cash flow maturity profiles based on both historical experiences and contractual expectations to project our liquidity requirements. We seek to preserve prudent liquidity and funding capabilities.
We are not aware of any significant demands to change the level of liquidity needed to support our normal business activities. We make use of various borrowing facilities provided by several financial institutions. We also successfully issued various bonds in previous years (including 2016, 2017 and 2018), and raised funds through our commercial paper programs. In addition, reverse repurchasing agreements are contracted, and Novartis has entered into credit support agreements with various banks for derivative transactions.
The maturity schedule of our net debt can be found in “Item 18. Financial Statements—Note 28. Financial instruments – additional disclosures.”

5.C Research and development, patents and licenses

Our R&D spending totaled USD 9.1 billion, USD 9.0 billion and USD 9.0 billion (USD 8.7 billion, USD 8.1 billion and USD 8.5 billion, excluding impairments and amortization charges) for the years 2018, 2017 and 2016, respectively.
Each of our divisions has its own R&D and patent policies. Our divisions have numerous products in various stages of development. For further information on these policies and these products in development, see “Item 4. Information on the Company—Item 4.B Business overview.”
As described in the risk factors section and elsewhere in this Annual Report, our drug development efforts are subject to the risks and uncertainties inherent in any new drug development program. Due to the risks and uncertainties involved in progressing through preclinical development and clinical trials, and the time and cost involved in obtaining regulatory approvals, among other factors, we cannot reasonably estimate the timing, completion dates and costs, or range of costs, of our drug development program, or of the development of any particular development compound (see “Item 3. Key Information—Item 3.D Risk factors”). In addition, for a description of the research and development process for the development of new drugs and our other products, and the regulatory process for their approval, see “Item 4. Information on the Company—Item 4.B Business overview.”

5.D Trend information

Please see “—Item 5.A Operating results—Factors affecting results of operations” and “Item 4. Information on the Company—Item 4.B Business overview” for trend information.

5.E Off-balance sheet arrangements

We have no unconsolidated special purpose financing or partnership entities or other off-balance sheet arrangements that have or are reasonably likely to have a current or future effect on our financial condition, changes in financial condition, revenues or expenses, results of operations, liquidity, capital expenditures or capital resources, that is material to investors. See also “Item 18. Financial Statements—Note 27. Commitments and contingencies,” and matters described in “— Item 5.F Tabular disclosure of contractual obligations.”

5.F Tabular disclosure of contractual obligations

The following table summarizes the Group's contractual obligations and other commercial commitments, as well as the effect these obligations and commitments are expected to have on the Group's liquidity and cash flow in future periods:

	Payments due by period				
(USD millions)	Total	Less than 1 year	2–3 years	4–5 years	After 5 years
Non-current financial debt, including current portion	25 660	3 190	4 117	4 863	13 490
Interest on non-current financial debt, including current portion	5 994	572	892	775	3 755
Operating leases	3 612	372	500	377	2 363
Unfunded pensions and other post-employment benefit plans	2 094	122	254	266	1 452
Research and development potential milestone commitments	4 417	228	1 632	1 663	894
Property, plant and equipment purchase commitments	289	280	9		
Total contractual cash obligations	42 066	4 764	7 404	7 944	21 954

The Group intends to fund the research and development; property, plant and equipment; and intangible asset purchase commitments with internally generated resources.

For other contingencies, see "Item 4. Information on the Company—Item 4.D Property, plants and equipment—Environmental matters," "Item 8. Financial Information—Item 8.A Consolidated statements and other financial information," "Item 18. Financial Statements—Note 19. Provisions and other non-current liabilities," and "Item 18. Financial Statements—Note 27. Commitments and contingencies."

Item 6. Directors, Senior Management and Employees

6.A Directors and senior management

The information set forth under “Item 6.C Board practices—Corporate governance—Our Board of Directors—Board of Directors” and “Item 6.C Board practices—Corporate governance—Our management—Executive Committee” is incorporated by reference.

6.B Compensation

Dear shareholder,

As Chairman of the Compensation Committee of the Board of Directors, I am pleased to share with you the 2018 Compensation Report of Novartis AG. It follows a similar structure to the report presented in January 2018, which was supported by over 90% of shareholders.

During 2018, we continued to engage with shareholders and proxy advisors to gather feedback on the proposed evolution of the compensation system for the Executive Committee, and we would like to thank you for the constructive dialogue. It has helped shape the changes, enhancements and simplifications we are making (effective January 1, 2019) to further align our compensation systems and disclosures with our strategy and best practice.

The Executive Committee underwent a number of key changes during the course of 2018, with the most significant being the appointment of our new Chief Executive Officer, Vasant Narasimhan, in February 2018. Dr. Narasimhan was appointed by the Board of Directors not only for his innovative mindset and leadership experience but also for his integrity, values and behaviors, which are the foundation blocks of our culture. Dr. Narasimhan and the other Executive Committee members are driving our strategy to build a leading, focused innovative medicines company powered by advanced therapy platforms and data science with five strategic priorities: innovation, operational excellence, data and digital, people and culture, and building trust with society.

2018 Company performance

Novartis delivered strong performance in 2018, with net sales up 5% in constant currencies (cc), core operating income up 8%, and free cash flow up 12%. All these were ahead of targets set by the Board of Directors at the start of the year. Operating income declined 5%, mainly due to the impact of M&A transactions made to transform Novartis into a leading, focused medicines company, and of restructuring to drive major productivity programs. Net income increased 64%, primarily due to the one-off gain from the sale of the OTC joint venture. Strong performance was driven by the growth drivers, mainly in the Innovative Medicines Division, including contributions from the AAA acquisition. *Cosentyx* sales reached USD 2.8 billion (+36% cc), *Entresto* sales more than doubled to reach USD 1 billion, and *Promacta/Revolade, Tafinlar + Mekinst, Jakavi* and *Kisqali* sales all delivered strong double-digit growth. Results in the Sandoz Division were negatively impacted by continued industrywide pricing pressures in the US retail generics market. Sandoz Biopharmaceuticals sales grew to USD 1.4 billion (+24% cc), mainly driven by the launch of *Erelzi* (etanercept) and *Rixathon* (rituximab) in Europe, and *Zarxio* (filgrastim) in the US. The Alcon turnaround continued.

In addition to delivering 2018 performance through strong sales growth and commercial execution, Novartis continued to focus on managing its costs, including actions to streamline the Novartis Business Services and Novartis Technical Operations organizations.

Further highlights of strong performance against the five strategic priorities included above-target performance on the delivery of the innovation pipeline; optimization of the business unit portfolio through major spin-off, divestment and acquisition activity; good commercial execution; starting a culture transformation; taking steps to simplify processes globally; and finally, prioritizing corporate responsibility projects, including the renewed commitment to malaria and leprosy.

In 2018, shareholders benefited from a one-year total shareholder return (TSR) of 4.5%, and between 2016 and 2018, they benefited from a three-year TSR of 8.5%.

2018 realized compensation

In light of our CEO’s achievements, including the Company’s strong performance and his focus on the five strategic priorities noted above, the Board of Directors determined that he will be awarded a 2018 Annual Incentive of CHF 3 189 606, which is 145% of target, within the payout range 0% to 200%.

The Long-Term Performance Plan (LTPP) 2016-2018 performance cycle award vested at a value of CHF 1 796 381, which is 136% of target, within the payout range of 0% to 200%. This was based on cumulative three-year Novartis Cash Value Added performance above target (driven by strong sales execution and solid cost controls) and long-term innovation achievements also above target. Further information on this performance is provided on page 148.

The Long-Term Relative Performance Plan (LTRPP) 2016-2018 award was based on three-year relative TSR compared to the global healthcare peer group (see page 149). Novartis ranked No. 11 out of 13 companies, resulting in

the award lapsing in full.

These incentive performance outcomes, combined with base salary, pension, other benefits, share price movement and dividend equivalents, resulted in 2018 total realized compensation for the CEO of **CHF 6 680 288**.

The 2018 total realized compensation for the Executive Committee members (comprising the CEO, the 12 active Executive Committee members, and the four previous Executive Committee members who stepped down during the financial year) was CHF 66.3 million. When compared to the total realized compensation for 2017 (CHF 47.5 million), the difference is primarily due to changes in the composition of the Executive Committee. There has been both an increase in the number of Executive Committee members and an overlap of departing and appointed members, including the CEO in 2018. Details on realized compensation for the Executive Committee members can be found on page 151.

In 2018, there was no legal or factual basis on which to exercise malus or clawback for current or former Executive Committee members. However, the Compensation Committee and the Board of Directors decided to apply its discretion, as foreseen in the plan rules, to reduce the 2018 Annual Incentive to below-target levels for certain executives in relation to their responsibilities.

Executive Committee compensation system for 2019

Every year, the Compensation Committee conducts a review of the Executive Committee compensation system. The 2018 review focused on the structure and performance measures of the Long-Term Incentive plans, taking into account a desire for simplification and the principle of compensating executives more directly on performance linked to our strategic priorities of accelerating top- and bottom-line growth.

This led to the decision to combine the existing Long-Term Performance Plan and Long-Term Relative Performance Plan into a single Long-Term Incentive plan and to replace Novartis Cash Value Added with net sales growth and core operating income growth for the 2019-2021 performance cycle onward. The objective is to align the Long-Term Incentive with the evolving Group strategic imperatives of accelerating growth and margin expansion to drive long-term value. The Compensation Committee decided to retain the long-term innovation and relative total shareholder return performance measures, and an equal weighting will apply to each of the four performance measures.

Further details on the 2019 compensation system can be found on pages 162 and 163.

Alcon

In 2018, the Board of Directors communicated its intention to spin off Alcon in the first half of 2019. To avoid any conflict of interest following news of the intention to spin off Alcon, the former CEO, Alcon, F. Michael Ball, stepped down from the CEO, Alcon position and from the Novartis Executive Committee on July 1, 2018, commencing his 12-month contractual notice period that will end on the Alcon spin-off date (or June 30, 2019, if later). He is still entitled to the one-off award of 50 000 performance share units that were awarded in February 2016 when he joined Novartis, subject to the achievement of targets linked to the turnaround of Alcon during the 2016-2018 performance cycle. In 2016, performance was tracking below target. However, in 2017 and 2018, Alcon began to close the gap versus the targets. Given that some of the performance measures are assessed relative to peers, the achievements and final payout of this three-year Long-Term Incentive award will be disclosed in the 2019 Compensation Report, once the final performance is known.

2019 Annual General Meeting

In line with our Articles of Incorporation, at the 2019 Annual General Meeting (AGM), shareholders will be asked to approve the maximum aggregate amount of compensation for members of the Board of Directors from the 2019 AGM to the 2020 AGM, and the maximum aggregate amount of compensation for members of the Executive Committee for financial year 2020. For the Board of Directors, the amount remains broadly unchanged compared to the prior year. For the Executive Committee, the requested maximum aggregate amount of compensation remains unchanged compared to the prior year. Shareholders will also be asked to endorse this Compensation Report in an advisory vote.

On behalf of Novartis and the Compensation Committee, I would like to thank you for your continued support and feedback, which we consider extremely valuable in driving improvements in our compensation systems and practices. I invite you to send your comments to me at the following email address: investor.relations@novartis.com.

Respectfully,

Enrico Vanni, Ph.D.

Chairman of the Compensation Committee

Compensation at a glance

2018 Executive Committee compensation system

Fixed pay and benefitsAnnual base salaryPension and other benefitsPerformance-related variable payAnnual IncentiveLong-term share awardsLTPP1LTRPP2PurposeReflects responsibilities, experience and skill setsProvides retirement and risk insurances (tailored to local market practices/regulations)Rewards for perfor–mance against short-term financial and strategic objectives, and Values and BehaviorsRewards long-term shareholder value creation and innovation in line with our strategyForm of paymentCashCountry/individual-specific50% cash50% equity3 deferredfor three yearsEquity, vesting following a three-year performance periodPerformance measures—Balanced scorecard comprising:•Financial measures (60%)•Strategic objectives4 (40%)•Novartis Cash Value Added (75%)•Innovation milestones (25%)•Relative TSR versus global sector peers (100%)51LTPP = Long-Term Performance Plan 2LTRPP = Long-Term Relative Performance Plan3Executive Committee members may elect to receive more of their Annual Incentive in equity instead of cash.4 Strategic objectives are aligned with the five strategic pillars: innovation, operational excellence, data and digital, people and culture, and building trust with society.5For the 2018-2020 performance cycle, the peer group comprises 15 global healthcare companies, as listed on page 140.

Target incentive opportunity levels for the CEO are 150% and 325% of base salary for the Annual Incentive and Long-Term Incentives (LTPP and LTRPP), respectively. Based on Novartis compensation guidelines, the other members of the Executive Committee have Annual Incentive and Long-Term Incentive target opportunity levels that range from 80% to 120%, and 160% to 270% of base salary, respectively. The payout range remains at 0% to 200% of target opportunity based on achievement against performance.

Compensation governance at a glance

A summary of the compensation decision authorization levels within the parameters set by the AGM is shown below, along with an overview of the risk management principles.

Decision on	Decision-making authority
Compensation of Chairman and other Board members	Board of Directors
Compensation of CEO	Board of Directors
Compensation of other Executive Committee members	Compensation Committee

Executive Committee compensation risk management principles

• Rigorous performance management process
• Balanced mix of short-term and long-term variable compensation elements
• Performance evaluation under the Annual Incentive includes an individual balanced scorecard
• Performance-based Long-Term Incentives, with three-year cycles
• All variable compensation is capped at 200% of target
• Contractual notice period of 12 months
• Post-contractual non-compete period limited to a maximum of 12 months from the end of employment (annual base salary and prior-year Annual Incentive only) as per contract, if applicable
• Good and bad leaver provisions apply to the variable compensation of leavers
• No severance payments or change-of-control clauses
• Clawback and malus principles apply to all elements of variable compensation
• Share ownership requirements; no hedging or pledging of Novartis share ownership position

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2018 CEO pay for performance – outcomes

Measure	Target	Achievement versus target
2018 Annual Incentive (see pages 145-146 for further details)		
Financial measures 60% of total Annual Incentive, comprising:		
Group net sales (cc) (30%)	USD 50447 million	Above
Group operating income (cc) (30%)	USD 8504 million	Met*
Group free cash flow as a % of sales (cc) (20%)	20%	Significantly above
Share of peers for Novartis Group (USD) (20%)	9.3%	Met
Overall assessment of Group financial targets in constant currencies		Above
Strategic objectives 40% of total Annual Incentive, comprising:		
Innovation (20%)		Significantly above
Operational excellence (20%)		Above
Data and digital (20%)		Met
People and culture (including Values and Behaviors) (20%)		Above
Building trust with society (including access to healthcare and reputation) (20%)		Met
Overall assessment of strategic objectives		Above
Overall assessment of CEO balanced scorecard		Above Target
TOTAL Annual Incentive: 145% of target (payout range 0% 200%) *The Board concluded that the achievement for Group operating income versus target was “met” following adjustments mainly for M&A transactions made to transform Novartis into a leading, focused medicines company, and for higher restructuring costs to drive major productivity programs, which were not known at the time of target setting.		
2016-2018 Long-Term Incentives (see pages 147-149 for further details)		
Long-Term Performance Plan (LTPP)		
Novartis Cash Value Added (cc) (75%)	USD 5.1 billion	Above
Key innovation milestones (25%)		Above
TOTAL LTPP: 136% of target (payout range 0% 200%)		
Long-Term Relative Performance Plan (LTRPP)		
Relative TSR against a global healthcare peer group (USD)	Below threshold	
TOTAL LTRPP: 0% of target (payout range 0% 200%)		

2018 total realized compensation for the CEO

The 2018 total realized compensation for the CEO was **CHF 6 680 288**. It includes payouts of the Annual Incentive, LTPP and LTRPP based on actual performance assessed for cycles concluding in 2018.

CHF	Annual base salary[1]	Pension and other benefits	2018 Annual Incentive[1]	LTPP 2016-2018[2]	LTRPP 2016-2018[2]	Total realized compensation
Vasant Narasimhan (CEO from February 1, 2018)	1 491 667	202 634	3 189 606	1 796 381	066 802	881

Base salary and Annual Incentive reflect the compensation relating to Vasant Narasimhan’s roles in 2018 as Head of Global Drug Development (January 1, 2018 - January 31, 2018) and CEO (from February 1, 2018).

2The shown amounts represent the underlying share value of the total number of shares vested (including dividend equivalents) to the CEO for the LTPP and LTRPP performance cycle 2016 -2018, which were granted before Vasant Narasimhan was appointed CEO.

2018 Board compensation system

A cost-neutral rebalancing of the Board of Directors fee structure was approved at the 2018 AGM, better recognizing the increased responsibilities and time commitment of the Board committees. All fees to Board members are delivered at least 50% in equity and the remainder in cash.

CHF 000s	AGM 2018-2019 annual fee
Chairman of the Board	3 800
Board membership	280
Vice Chairman	50
Chair of the Audit and Compliance Committee	130
Chair of the Compensation Committee	90
Chair of the following committees: • Governance, Nomination and Corporate Responsibilities Committee • Research & Development Committee • Risk Committee	70
Membership of the Audit and Compliance Committee	70
Membership of the following committees: • Compensation Committee • Governance, Nomination and Corporate Responsibilities Committee • Research & Development Committee • Risk Committee	40

2018 Board compensation

Total actual compensation earned by Board members in the 2018 financial year is shown in the table below.

CHF 000s	2018 total compensation [1]
Chairman of the Board	3 804
Other 12 members of the Board	4 431
Total	8 235

[1] Includes an amount of CHF 19 958 for mandatory employer contributions for all Board members paid by Novartis to governmental social security systems. This amount is out of total employer contributions of CHF 383 864, and provides a right to the maximum future insured government pension benefit for the Board member.

Executive Committee compensation philosophy and principles

Novartis compensation philosophy

Our compensation philosophy aims to ensure that Executive Committee members are rewarded according to their success in implementing the Company strategy, and their contribution to Company performance and long-term value creation.

Pay for performance•Variable compensation is tied directly to the achievement of strategic Company targetsShareholderalignment•Our incentives are significantly weighted toward long-term equity-based plans•Measures under the Long-Term Incentive plans are calibrated to promote the creation of shareholder value•Executive Committee members are expected to build and maintain substantial shareholdingsBalanced rewards•Balanced set of measures to create sustainable value•Mix of targets based on financial metrics, strategic objectives, and performance versus our competitorsBusiness ethics•The Novartis Values and Behaviors are an integral part of our compensation system•They underpin the assessment of overall performance for the Annual IncentiveCompetitive compensation•Total compensation must be sufficient to attract and retain key global talent•Overarching emphasis on pay for performance

Alignment with Company strategy

The Novartis strategy is to reimagine medicine to improve and extend people's lives. We use innovative science and technology to address some of society's most challenging healthcare issues. We discover and develop breakthrough treatments and find new ways to deliver them to as many people as possible. We reward those who invest their money, time and ideas in our Company. We have five strategic priorities: innovation, operational excellence, data and digital, people and culture, and building trust with society.

To align the compensation system with this strategy and to ensure that Novartis is a high-performing organization, the Company operates both a short-term Annual Incentive and two Long-Term Incentive plans with a balanced set of measures and targets.

The Board of Directors determines specific, measurable and time-bound performance measures for the Annual Incentive and the two Long-Term Incentive plans.

Approach to market benchmarking

There remains significant competition for top executive talent with deep expertise, competencies and proven performance within the pharmaceutical and biotechnology industries. As such, external peer compensation data is one of a number of key reference points considered by the Board of Directors and the Compensation Committee when making decisions on executive pay, helping to ensure that the compensation system and compensation levels at Novartis remain competitive. Novartis makes the commitment to shareholders to confirm benchmarking practices, including the peer group, each year.

The Compensation Committee believes in a rigorous approach to peer group construction and maintenance. The Compensation Committee also believes that using a consistent set of peers that are similar in size and scope enables shareholders to evaluate the compensation year on year and make pay-for-performance comparisons. As such, following a review of the benchmarking peer group, the Compensation Committee decided to maintain the same primary peer group of 15 global healthcare companies, as presented below.

Global healthcare peer groupAbbVieBiogenEli Lilly & Co.Johnson & JohnsonPfizerAmgenBristol-Myers SquibbGilead SciencesMerck & Co.RocheAstraZenecaCelgeneGlaxoSmithKlineNovo NordiskSanofi

The companies in this peer group reflect our industry and are similar to Novartis in terms of both size and scope of operations. Target compensation is generally positioned around the market median benchmark for comparable roles within this group.

Although Novartis is headquartered in Switzerland, more than a third of sales come from the US market, and the US remains a significant talent pool for the recruitment of executives by the Company. All current Executive Committee members have either worked in or have extensive experience with the US market. It is therefore critical that Novartis is able to attract and retain key talent globally, especially from the US.

For consideration of European and local practices, the Compensation Committee also references a cross-industry peer group of Europe-headquartered multinational companies, selected on the basis of comparability in size, scale, global scope of operations, and economic influence to Novartis. Five of these companies focus exclusively on healthcare: AstraZeneca, GlaxoSmithKline, Novo Nordisk, Roche and Sanofi. Ten companies are selected from the STOXX® All

Europe 100 Index representing multiple sectors: Anheuser-Busch InBev, Bayer, BMW, Daimler, Danone, Heineken, L'Oréal, Merck KgaA, Nestlé and Unilever.

Executive Committee appointments compensation policy

Element of compensationPolicyLevelThe overall package should be market-competitive to facilitate the recruitment of global executive talent with deep expertise and competencies.The Compensation Committee will always intend to pay no more than it believes is necessary to attract the required individual.Annual base salaryThe Compensation Committee may appoint individuals who are new to a role on an annual base salary that is below the market level, with a view to increasing this toward a market level over a period of three to four years as an individual develops in the role.This prudent approach ensures pay levels are merit-based, with increases dependent on strong performance and proven ability in the role over a sustained period.IncentivesThe ongoing compensation package will normally include the key compensation elements and incentive opportunities in line with those offered to current Executive Committee members.In exceptional circumstances, higher Long-Term Incentive opportunities than those offered to current Executive Committee members may be provided, at the Compensation Committee's discretion.Performance measures may include business-specific measures tailored to the specific role.Pension and other benefitsNewly appointed Executive Committee members are eligible for a local market pension and other benefits in line with the wider senior employee group.BuyoutsThe Compensation Committee seeks to balance the need to offer competitive compensation opportunities to acquire the talent required by the business with the principle of maintaining a strong focus on pay for performance.As such, when an individual forfeits variable compensation as a result of an appointment at Novartis, the Compensation Committee may offer replacement awards in such form as the Compensation Committee considers appropriate, taking into account relevant factors.Relevant factors include the replacement vehicle (i.e., cash, restricted share units, restricted shares or performance share units), whether the award is contingent on meeting performance conditions or not, the expected value of the forfeited award, the timing of forfeiture (i.e., Novartis mirrors the blocking or vesting period of the forfeited award) and the leaver conditions, in case the recruited individual leaves Novartis prior to the end of the blocking or vesting period.The Compensation Committee will seek to pay no more than is required to match the commercial value or fair value of payments and awards forfeited by the individual.International mobility If individuals are required to relocate or be assigned away from their home location to take up their position, relocation support may be provided in line with our global mobility policies (i.e., relocation support, tax equalization).

Treatment of variable compensation for Executive Committee leavers

Element of compensationPolicyAnnual Incentive cash elementRetirement, termination by the Company (for reasons other than performance or conduct), change of control, disability, deathPro-rata Annual Incentive is paid to reflect the portion of the year the individual was employed.Any other reasonNo Annual Incentive.Annual Incentive mandatory deferral into restricted shares/ RSUsIf a participant leaves employment due to voluntary resignation or misconduct, unvested restricted shares and restricted share units (RSUs) are forfeited. All awards are subject to non-compete terms until the end of the three-year blocking date, starting from the date of grant.Annual Incentive voluntary restricted shares/RSUs/ADRs (US associates only)Awards are not subject to forfeiture during the deferral period. Long-Term Incentives (LTPP/LTRPP)Voluntary resignation or termination by the Company for misconductAll of the award will be forfeited.Termination by the Company for reasons other than performance or conduct, and change in control due to divestmentAwards vest on the regular vesting date, subject to performance, on a pro-rata basis for time spent with the Company during the performance cycle. There is no accelerated vesting.Retirement For grants made until the end of 2018, awards will vest on the normal vesting date, subject to performance, without the application of time pro-rating. For grants made to members of the Executive Committee from 2019 onward, awards will vest on the normal vesting date, subject to performance, with the application of time pro-rating.Death or long-term disability Accelerated vesting at target will be applied.Non-compete agreementAll awards are subject to non-compete terms against the healthcare peer group until the vesting date.

Malus and clawback

Any incentive compensation paid to Executive Committee members is subject to malus and clawback rules. This means that the Board for the CEO, and the Compensation Committee for the other Executive Committee members, may decide – subject to applicable law – to retain any unpaid or unvested incentive compensation (malus), or to recover incentive compensation that has been paid or has vested in the past (clawback). This applies in cases where the payout conflicts with internal management standards, including Company and accounting policies, or violates laws.

This principle applies to both the short-term Annual Incentive and Long-Term Incentive plans.

Executive Committee performance management process

To foster a high-performance culture, the Company applies a uniform performance management process worldwide, based on quantitative and qualitative criteria, including our Values and Behaviors. All Novartis associates, including the CEO and other Executive Committee members, are subject to a formal three-step process: objective setting, performance evaluation and compensation determination. This process is explained below.

Performance targets are generally set before the start of the relevant performance cycle. There is a rigorous framework in place for establishing targets to ensure they are suitably robust and challenging, and align with the strategic priorities of the Group. The key factors taken into account when setting targets include:

• Novartis strategic priorities
• Internal and external market expectations
• Regulatory factors (e.g., new launches, patent expiries)
• Investment in capital expenditure
• Values and Behaviors

The targets are challenged at multiple stages before they are ultimately approved by the Board of Directors. In line with good governance practices, the Compensation Committee works to set targets that are ambitious and challenging but that do not encourage undue risk-taking.

Following the end of the performance cycle, the Board of Directors and the Compensation Committee consider performance against the targets originally set. The CEO and Executive Committee members are not present while the Board of Directors and Compensation Committee discuss their individual performance evaluations. Prior to determining the final outcome, related factors such as performance relative to peers, wider market conditions, general industry trends and good practice are used to inform the overall performance assessment.

Objective setting•The CEO discusses his targets with the Chairman of the Board; they are then reviewed and approved by the Board of Directors, based on input from the Compensation Committee.•For other Executive Committee members, targets for their division or unit are initially discussed with the CEO and subsequently approved by the Board and Compensation Committee.Performance evaluation•The CEO’s performance against the individual balanced scorecard is assessed by the Board.•For Executive Committee members, the CEO discusses with the Chairman each member’s performance (assessed against his or her individual balanced scorecard) before making recommendations to the Board.•Periodic assessments, including at the mid-year stage, ensure progress is suitably tracked.Compensation determination •A recommendation for the CEO’s variable pay is made by the Compensation Committee to the Board for final determination.•For the Long-Term Incentive financial measure payout schedules, a formulaic approach applies and the Compensation Committee can also exercise judgment to ensure there is appropriate alignment between payout levels and overall performance achieved. The same principle of discretion applies to the relative TSR and innovation performance measures.•The CEO’s recommendations for other Executive Committee members are considered and approved by the Compensation Committee, after which the Board is notified of the outcomes.

2018 Executive Committee compensation

Performance outcomes

Annual base salaryOverview•The annual base salary is reviewed each year, taking into account the individual's role, performance and experience; business performance and the external environment; increases across the Group; and market movements.2018 annual base salariesThe 2018 annual base salaries were as follows:•CEO (effective February 1, 2018): CHF 1550000 (CEO base salary may increase as he develops in the role) •OTHER EXECUTIVE COMMITTEE MEMBERS (effective March 1, 2018): Increases for two individuals based on their promotions were made as of March 1, 2018, as disclosed in the 2017 Compensation Report. For the other Executive Committee members, no merit increases were awarded during the year, except for promotions in roles, and appointments to the Executive Committee during the course of 2018. Pension and other benefitsOverview•Pension and other benefits do not constitute a significant proportion of total compensation and are provided to Executive Committee members on the same terms as all other associates, based on country practices and regulations.•The Company operates both defined benefit and defined contribution pension plans (see also Note 24 to the Group's consolidated financial statements).•Novartis may provide other benefits according to local market practice. These include Company car provision, tax and financial planning, and insurance benefits.•Executive Committee members who are required to relocate internationally may also receive additional benefits (including tax equalization), in line with the Company's global mobility policies.

2018 Annual Incentive
PLAN OVERVIEWTarget Annual Incentive On-target opportunities•CEO: 150% of annual base salary•Other Executive Committee members: 80% to 120% of annual base salaryPerformance measures•A simplified Annual Incentive balanced scorecard was introduced in 2018, containing:•Financial performance measures related to Group, division or business unit, where relevant (60% weighting)•Five key strategic objectives in the areas of innovation, operational excellence, data and digital, people and culture, and building trust with society (40% weighting)•The 2018 balanced scorecard targets and achievements of the CEO are detailed on the next page.•The 2018 balanced scorecard for other Executive Committee members includes Group financial targets as well as financial or other quantitative targets that relate to their division or business unit, if applicable.•Values and Behaviors are a key component of the Annual Incentive and are embedded in our culture. As such, members of the Executive Committee are expected to demonstrate these to the highest standards.Target setting•Financial targets are set at the beginning of each financial year and align with the strategic plan proposed by management to the Board for approval.•The strategic objectives are aligned with the most important priorities in any performance year.Payout ranges•The simplified payout schedule for the Annual Incentive incorporates performance against financial and strategic objectives. The payout range is 0% to 200% of on-target opportunity based on performance, as shown below:PERFORMANCEPAYOUT (% of on-target)Outstanding170% 200%Exceeds expectations130% 160%Meets expectations80% 120%Partially meets expectations40% 70%Below expectations0% 30%Payout formulaPayout vehicle•At the end of the performance period, 50% is paid in cash, and the remaining 50% is delivered in Novartis restricted shares or RSUs, deferred for three years (see table on page 142 for details on leaver treatment).•Executives may choose to receive all or part of the cash portion of their Annual Incentive in Novartis shares or American Depositary Receipts (ADRs; US only) that will not be subject to forfeiture conditions. In the US, awards may also be delivered in cash under the US-deferred compensation plan.•Clawback and malus provisions apply to all Annual Incentive awards.Dividend rights, voting rights and settlement•Novartis restricted shares carry voting rights and dividends during the vesting period. RSUs are of equivalent value but do not carry voting rights and dividends during the vesting period.•Following the vesting period, settlement of RSUs is made in unrestricted Novartis shares or ADRs. Annual base salaryxTarget incentive (% of base salary)=Target Annual IncentiveAnnual base salaryxTarget incentive (% of base salary)xPayout factor (% of target: 0%200%)=Realized Annual Incentive
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2018 ceo Balanced Scorecard This section presents the balanced scorecard for the CEO. Balanced scorecard performance is measured in constant currencies to reflect operational performance that can be influenced. The Board uses a stringent process to set ambitious financial targets to incentivize superior performance. Achievement versusCEO achievements 2018TargettargetFinancial measures 60% of total Annual Incentive, comprising: Group net sales (cc) (30%) 50447 millionAboveGroup operating income (cc) (30%)| 8504 million|Met*Group free cash flow as a % of sales (cc) (20%)| 20%|Significantly aboveShare of peers for Novartis Group (USD) (20%) 9.3%MetOverall assessment of Group financial targets in constant currencies Above*The Board concluded that the achievement for Group operating income versus target was “met” following adjustments mainly for M&A transactions made to transform Novartis into a leading, focused medicines company, and for higher restructuring costs to drive major productivity programs, which were not known at the time of target setting.Strategic objectives 40% of total Annual Incentive, comprising:Innovation (20%)|Significantly aboveNovartis was ranked No. 1 by EvaluatePharmaon value creation from pipeline products, with more than 200 projects in clinical development, as of December 31, 2018. With the acquisitions of AveXis, AAA and Endocyte, Novartis is building leading advanced therapy platforms in gene therapy, radioligand therapy and cell therapy. Novartis had four US FDA breakthrough therapy designations (e.g., AVXS-101), 20 major approvals (e.g., Aimovig in the US and EU), and 20 major submissions (e.g., BYL719, alpelisib). 70% of Phase II and III trials in Global Drug Development are on track for recruitment targets. The majority of projects in the Novartis Institutes for BioMedical Research are either first-in-class targets or modalities. Operational excellence (20%)|AboveNovartis set out on its strategy to focus as a leading innovative medicines company. We announced the planned Alcon spin-off, divested the Sandoz US dermatology business and generic oral solids portfolio to Aurobindo, and divested the OTC joint venture stake to GSK. The manufacturing and Novartis Business Services transformations are in early stages and need to be carefully executed. Global Drug Development efficiency has improved, strengthened by the launch of a series of process automations. Launch capability has been built to further strengthen commercial execution, contributing to four new drugs reaching blockbuster status. 98.5% of inspections at manufacturing sites resulted in at least acceptable outcomes. Additional financial targets, including core operating income, net income, core EPS and reported EPS, were all ahead of target. Data and digital (20%)|MetPriority digital initiatives were defined for all business units to improve the way we innovate (e.g., partnerships with Science 37 and Pear Therapeutics), operate and commercialize new therapies, including data acquisition, data governance and infrastructure. Twelve major projects to embed digital technologies and advanced data into all areas of the business were initiated, and strong progress was made. The digital organization was established, and includes 1500 associates from teams across the organization. Capability building is ongoing to upskill the organization in data and digital at global scale.People and culture (20%)|AboveNovartis began a cultural transformation toward a curious, inspired and “unbossed” organization. Around 14000 associates completed a survey (Organizational Culture Inventory®) to establish a baseline for measuring progress toward the desired culture. Around 27000 associates took part in a crowdsourcing event seeking ways to implement culture change. Significant progress was made toward simplifying the organization and reducing bureaucracy with the simplification of the process for reviewing employee performance and the introduction of a companywide (rather than divisional) business performance factor contributing to bonus payouts for the associates below Executive Committee level (excluding the field force). Good progress was made on diversity, with two female Executive Committee members and two senior female leaders reporting to the CEO. Novartis ranked No. 2 in the Thomson Reuters Diversity & Inclusion Index and pledged its commitment to gender-equal pay and LGBTI rights at the United Nations.Building trust with society (including access to healthcare and reputation) (20%) | MetProjects in corporate responsibility were prioritized with a renewed commitment to malaria and leprosy. Almost 2.3 million Novartis Access treatments were delivered to patients at USD 1 per treatment, per month, and Healthy Family reached 7.8 million people with health education initiatives. Our ranking in the Access to Medicine Index rose to No. 2, and our ranking in the Dow Jones Sustainability Index remained at No. 4. The role of Chief Ethics, Risk and Compliance Officer was added to the Executive Committee, and a principles-based approach to compliance through the Professional Practices Policy (P3) was established. Novartis approved new environmental sustainability targets, including the goal to achieve carbon neutrality by 2025. Important reputational matters occurred over the year, and the CEO is working to address them.Overall assessment of strategic objectives Above Overall assessment of CEO balanced scorecard Above TargetANNUAL INCENTIVE PAYOUTPayoutOverall, the Board approved an Annual Incentive payout for the CEO amounting to CHF 3 189 606, which is 145% of target, within the range of 0-200%.
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Long-Term Incentive plans, 2016-2018 cycle

• The Long-Term Performance Plan (LTPP) is the first of two Long-Term Incentive plans, which rewards creation of long-term value and innovation.

• The Long-Term Relative Performance Plan (LTRPP) is the second of two Long-Term Incentive plans, which rewards competitive shareholder return relative to the global healthcare peer group.

The structure of the two plans is summarized below.

OVERVIEW OF LONG-TERM INCENTIVE PLANSGrant formula At the start of the performance cycle, performance share units (PSUs) are granted under each of the Long-Term Incentive plans, as follows:On-target opportunity and payout rangeLTPP:•CEO: 200% of annual base salary•Other Executive Committee members: between 130% and 190% of annual base salaryLTRPP:•CEO: 125% of annual base salary•Other Executive Committee members: between 30% and 80% of annual base salaryPayout range•From 0% to 200% of the on-target amount based on performanceAward vehiclePSUs granted at the beginning of the cycle vest at the end of the three-year performance cycle and are converted into Novartis shares.PSUs carry dividend equivalents that are paid in shares at the end of the cycle to the extent that performance conditions have been met.Payout formula:Policy information on page 142 provides details on the treatment of Long-Term Incentive awards for leavers.Step 1Annual base salaryxTarget incentive %=Grant valueStep 2Grant value/Share price=Target number of PSUsTarget number of PSUsxPerformance factor+Dividend equivalents=Realized PSUs

LTPP performance outcomes

NOVARTIS CASH VALUE ADDED (NCVA) (75% OF LTPP)DescriptionNCVA incentivizes sales growth and margin improvement as well as asset efficiency. It is calculated as follows:1 WACC = weighted average cost of capital2 NCVA = (cash flow return on investment % WACC) x gross operational assets in constant currenciesThe NCVA performance factor is based on a 1:3 payout curve, whereby a 1% deviation in realization versus target leads to a 3% change in payout (for example, a realization of 105% leads to a payout factor of 115%).Accordingly, if performance over the three-year vesting period falls below 67% of target, no payout is made for this portion of the LTPP. Conversely, if performance over the three-year vesting period is above 133% of target, payout for this portion of the LTPP is capped at 200% of target.Group performance outcome for the 2016-2018 cycleDuring the 2016-2018 cycle, Novartis delivered an NCVA of USD 5.8 billion, 15% ahead of a target of USD 5.1 billion in constant currencies.When setting the target for the 2016-2018 cycle, the Compensation Committee took into account an impact of USD 3 billion for the loss of patent of Glivec/Gleevec compared to the previous cycle and other generic erosion. The 2016-2018 NCVA performance was mainly driven by the following: •Strong sales execution over the three-year cycle, including Cosentyx (+ USD 2.6 billion1), Entresto (+ USD 1.0 billion1), Promacta/Revolade (+ USD 0.8 billion1,2) and Tafinlar + Mekinist (+ USD 0.7 billion1,2), and the return of Alcon to growth.•Solid cost controls resulting in improved gross margin, including benefits from the implementation of the manufacturing transformation program, and increased R&D productivity. Over the three-year cycle, these cost actions supported launches via increased sales and marketing investments while broadly maintaining core operating income margin in constant currencies. Following the application of the agreed payout curve, the 115% achievement versus target generates a performance factor of 144% of target for this part of the LTPP.For Long-Term Incentive cycles starting from 2019, Novartis has decided to replace NCVA as the financial metric with a combination of a three-year net sales CAGR3 and a three-year core operating income CAGR.31 Represents the USD growth in annual sales (2018 vs. 2015)2 Acquisition of GSK oncology products closed in March 2015. 2015 Novartis results include 10 months of sales.3 Compound annual growth rateINNOVATION (25% OF LTPP)DescriptionInnovation is a key value driver for shareholders and is critical to our future. At the beginning of the cycle, the Research & Development Committee determines the most important target milestones, considering the following:•The expected future potential revenue•The potential qualitative impact of research and development on science and medicine•The potential impact of research and development on the treatment or care of patientsInnovation is specific to the respective head of the division or unit, and is a weighted average of the divisions or units for the CEO and Group function heads.At the end of the cycle, the Compensation Committee determines the payout factor based on the performance assessment made by the Research & Development Committee. In the healthcare industry, achievement of 60% to 80% of pipeline targets set at the beginning of a three-year cycle is considered good performance. The payout range 0% to 150% of target is based on the achievement of the target milestones, and payout above 150% of target is only delivered for truly exceptional performance. Group performance outcome for the 2016-2018 cycleDuring the 2016-2018 performance cycle, Novartis delivered solid performance versus target on innovation, which accelerated over the three-year performance period. Novartis was ranked No. 1 in 2018 by EvaluatePharmaon value creation from pipeline products. The Innovative Medicines Division achieved the US and EU submissions of Aimovig, the US and EU approvals of Kisqali (breast cancer), and the US and EU pediatric submissions of Kymriah (hematology and solid tumors). The US and EU filings of RTH258 (nAMD) are on track. Sandoz achievements included EU and US approvals of Hyrimoz, and EU approval of Zessly. Alcon achieved the EU launch of a next-generation IOL (Clareon monofocal) and the US filing of Daily Disposable Mass Market SiHy Sphere. NIBR initiated 10 new projects in Respiratory and discovered 27 new targets in Oncology. The US and EU submission of RLX030 (acute heart failure) was missed, as the pivotal Phase III study failed to confirm efficacy in the acute heart failure indication. Sandoz did not achieve the approval of several biosimilars in the US, including rituximab. Alcon voluntarily withdrew the recently approved CyPass from the market. Achievements during the cycle will contribute to the future success of Novartis and will bring innovative treatments to patients.Following input from the Research & Development Committee, the Board approved an innovation performance factor for the CEO and Group function heads of 110% of target.LTPP PAYOUTPayoutOverall, the Board approved an LTPP payout for the CEO amounting to CHF 1 796 381, which is of 136% of target, within the range of 0-200%. This amount includes CHF 153716 of dividend equivalents accrued, and CHF 172016 in share price evolution over the performance cycle. It is based on grants made in January 2016, prior to Vasant Narasimhan being appointed CEO.Operating income+Amortization, impairments, and adjusting for

gains/losses from non-operating assetsTaxesCapital charge (based on WACC1) on gross operational assets=NCVA2
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LTRPP performance outcomes

RELATIVE TOTAL SHAREHOLDER RETURN (TSR) (100% OF LTRPP)DescriptionPerformance is based on our TSR relative to a global healthcare peer group. Outperformance of this peer group is a key indicator that Novartis is delivering long-term value to its shareholders.The peer group and payout matrix for the 2016-2018 performance cycle are as follows:The payout matrix includes a significant reduction (including scope to reduce to nil) when Novartis does not outperform the majority of the companies in the group. At the end of the performance cycle, all companies are ranked in order of highest to lowest TSR in USD.The Compensation Committee uses its discretion to determine the payout factor within the ranges shown above, and takes into consideration factors such as absolute TSR, overall economic conditions, currency fluctuations and other unforeseeable economic situations.For the LTRPP 2017-2019 performance cycle onward, the revised peer group of 15 global healthcare companies applies, as listed on page 140. There will be no vesting for below-median performance for the LTRPP 2018-2020 performance cycle onward. Group performance outcomefor the 2016-2018 cycleNovartis TSR over the three-year period (2016-2018) was 8.5%. When compared to the global healthcare peer group, Novartis TSR ranked 11 out of 13 companies. LTRPP PAYOUT FOR THE 2016-2018 CYCLEPayout Based on the ranking, the Board approved an LTRPP payout of 0% of target for the CEO.2016-2018 peer group (12 companies, excluding Novartis)AbbotAstraZenecaGlaxoSmithKlinePfizerAbbVieBristol-Myers SquibbJohnson & JohnsonRocheAmgenEli Lilly & Co.Merck & Co.SanofiNovartis position Payout rangein the peer group(% of target)Position 1 3Position 4 6Position 7 10Position 11 13160% 200% 100% 140%20% 80%0%

Executive Committee membership changes in 2018

2018 Executive Committee member external appointments and buyout awards

The table below provides an overview of the Executive Committee external hires made during 2018. When an individual forfeits variable compensation as a result of an appointment at Novartis, the Compensation Committee may offer replacement awards, for example performance share units (PSUs), restricted share units (RSUs) or cash, on a like-for-like basis to mirror the forfeited compensation, based on evidence. Further details on our policy approach can be found on page 141.

During 2018, out of the four external newly appointed Executive Committee members, three were granted buyout awards in place of forfeited compensation, as described in the table below. Buyout awards are of equivalent economic value and are subject to the same vesting or performance period, payable no earlier than the compensation forfeited upon joining Novartis. Further details on the vesting of the awards below will be provided in relevant future compensation reports.

Name	Date of appointment	Cash payments (CHF)	Equity awards (CHF)	Total value at grant (CHF)
Elizabeth Barrett, CEO Oncology [1]	February 1, 2018	837 258	21 267 PSUs, vesting over the period 2019-2024	2 613 478
John Tsai, Head of Global Drug Development and Chief Medical Officer	May 1, 2018	2 089 657	6 095 PSUs and 21 286 RSUs, vesting over the period 2018-2022	4 181 566
Klaus Moosmayer, Chief Ethics, Risk and Compliance Officer	December 1, 2018	No cash buyout	8 857 PSUs, vesting over the period 2020-2022	808 821

[1] The equity awards presented in the table for Elizabeth Barrett were forfeited in full on December 31, 2018.

2018 Executive Committee member departures

In determining the compensation arrangements for departing Executive Committee members, the Compensation Committee ensures that contractual entitlements are respected and that all payments are in line with our plan rules and the Swiss Ordinance against Excessive Compensation in Listed Companies.

All Executive Committee members have a 12-month notice period during which they are entitled to their contractual base salary, Annual Incentive, pension and other benefits. During the notice period, no new grants of LTPP/LTRPP awards are made.

The plan rules require that any equity vesting will occur on the normal vesting date (i.e., there is no accelerated vesting), and malus and clawback as well as non-compete restrictions will continue to apply. No severance or non-compete payments are made to departing Executive Committee members. Further details on the policy treatment of variable compensation for departing Executive Committee members can be found on page 142.

Retired CEO Joseph Jimenez stepped down from his role on January 31, 2018, and his notice period ended on August 31, 2018. No Long-Term Incentive grants were awarded in January 2018 for the 2018-2020 performance cycle.

In 2018, for the three Executive Committee members who retired (the CEO, Group General Counsel and CEO of Alcon), full vesting of equity applies as per previous plan rules, as communicated in the 2017 Compensation Report. Going forward, retiring Executive Committee members will receive pro-rata vesting of equity.

The Board of Directors agreed to a six-month reduction of the notice period, without compensation, of the President of Novartis Operations and Country President of Switzerland, to allow him to take on a new position with a company that does not compete with Novartis from October 1, 2018. Pro-rata vesting of equity will apply.

The CEO, Novartis Oncology decided to step down and leave Novartis, as of December 31, 2018. The Board of Directors agreed to waive her 12-month notice period in full. Her final annual base salary payment was made in December 2018. Strictly in line with the Novartis incentive plan rules, her Annual Incentive for the 2018 performance

cycle, her Long-Term Incentives granted for the 2018-2020 performance cycle, and her unvested equity buyouts of 21 267 PSUs that were made at the point of her recruitment to replace lost equity at her former employer were forfeited in full.

Realized compensation

To aid shareholders' understanding of the link between pay and performance, the Compensation Committee discloses the realized compensation for the CEO individually, and for the other members of the Executive Committee on an aggregated basis. Disclosing realized compensation means that the Annual Incentive and the Long-Term Incentives are disclosed at the end of their respective performance cycles, reflecting actual payouts based on performance.

The total actual payout may vary year on year depending on multiple factors, including the composition of the Executive Committee and the tenure of its members (as new members may not have vested Long-Term Incentives), compensation increases, payout of variable compensation based on actual performance, share price fluctuations of Long-Term Incentives, and dividend equivalents.

2018 realized compensation for the CEO and other Executive Committee members

The table below reports fixed and other compensation for the year, including the Annual Incentive for the 2018 performance year, the realized Long-Term Incentives for the 2016-2018 performance cycle, and any buyouts vesting in 2018. The portion of the Annual Incentive paid in shares for the year 2018 is disclosed using the underlying value of Novartis shares at the date of grant, while the realized values of any other equity awards (including dividend equivalents) are calculated using the share price on the date of vesting.

		2018 annual base salary	2018 pension benefits[1]	2018 Annual Incentive		Long-Term Incentives		Other 2018 compensation	
						LTPP 2016-2018 cycle	LTRPP 2016-2018 cycle		
	Currency	Cash (amount)	Amount	Cash	Equity[2]	Equity (value at vesting date)[3]	Equity (value at vesting date)	Amount[2,4]	Total realized compensation (incl. share price movement)[5]
Executive Committee members active on December 31, 2018									
Vasant Narasimhan (CEO from February 1, 2018)	CHF	1 491 667	168 233	1 594 801	1 594 805	1 796 381	0	34 401	6 680 288
Aggregate realized compensation of the other 16 Executive Committee members, including the four members who stepped down during financial year 2018[6, 7]	CHF	9 297 021	1 874 671	5 727 765	5 532 316	24 079 974	0	13 131 653	59 643 400
Total	CHF	10 788 688	2 042 904[1]	7 322 566	7 127 121	25 876 355	0	13 166 054	66 323 688

See the next page for 2017 comparative figures.

[1] Includes mandatory employer contributions of CHF 4 336 for the CEO and CHF 78 403 for the other Executive Committee members paid by Novartis to governmental social security systems. This amount is out of total employer contributions of CHF 2 847 422 paid in 2018 for all Executive Committee members, and provides a right to the maximum future insured government pension benefit for the Executive Committee member.

[2] The portion of the Annual Incentive delivered in equity is rounded up to the nearest share, based on the closing share price on the grant date (January 22, 2019) of CHF 88.14 per Novartis share and USD 88.32 per ADR.

[3] The amounts represent the underlying share value of the 294 971 PSUs vesting on January 22, 2019, to the CEO and other Executive Committee members for the performance cycle 2016-2018, inclusive of earned dividend equivalents for the three-year cycle (details on following page). The taxable value is determined using the closing share price on the day the Novartis Board approved the final LTPP and LTRPP performance factors (i.e., January 22, 2019) of CHF 88.14 per Novartis share and USD 88.32 per ADR. Vasant Narasimhan, Shannon Thyme Klinger, Stefan Lang and André Wyss joined the Executive Committee during the course of the performance period 2016-2018, and as such, the information disclosed reflects their pro-rata LTPP 2016-2018 payout attributable to the period they were a member of the Executive Committee. Elizabeth Barrett, Bertrand Bodson, Paul Hudson, Klaus Moosmayer, John Tsai and Robert Weltevreden joined post the 2016 LTPP awards being made and hence did not receive an LTPP award for the 2016-2018 performance period.

[4] Includes any other perquisites, benefits in kind, international assignment benefits as per the global mobility policy (e.g., housing, international health insurance, children's school fees, tax equalization) as well as vested shares under LTPP after the step down date.

[5] All amounts are before deduction of the social security contribution and income tax due by the Executive Committee member.

[6] Comprises the compensation of the outgoing CEO, General Counsel, CEO of Alcon, and President of Novartis Operations and Country President Switzerland, including the vesting of their Long-Term Incentives for performance cycle 2016-2018, as per the plan rules. See page 150 for details.

[7] Amounts for Executive Committee members paid in USD were converted at a rate of UDS 1.00 = CHF 0.978, which is the same average exchange rate used in the Group's 2018 consolidated financial statements.

The 2018 total realized compensation for the CEO was **CHF 6 680 288**, and included the payouts of the Annual Incentive, LTPP and LTRPP based on actual performance assessed for cycles concluding in 2018. The base salary, pension and other benefits levels below include the compensation for Vasant Narasimhan in the role of Head of Global Drug Development and Chief Medical Officer during the period January 1, 2018, to January 31, 2018, and the LTPP and LTRPP levels reflect grants that were made in 2016, prior to Dr. Narasimhan being appointed CEO.

The column titled “Other 2018 compensation” in the 2018 total realized compensation of the Executive Committee includes the following:

• 1 443 vested ADRs (USD 123 146) to James Bradner, in lieu of the Long-Term Incentive that he forfeited when leaving his previous employer.

• 1 125 vested RSUs (CHF 83 700) and 9 015 vested PSUs (CHF 670 716) to Paul Hudson, in lieu of the Long-Term Incentive that he forfeited when leaving his previous employer. The PSUs had the same performance measures as the LTPP for the 2015-2017 performance cycle (NCVA and long-term innovation). Both awards vested in March 2018.

• Buyout payments made to two external newly appointed Executive Committee members, John Tsai and Elizabeth Barrett, totaling CHF 2 461 959 (cash and vested shares) and CHF 837 258 (cash), respectively.

The table and information below provide additional details on awards granted as part of the 2016-2018 LTPP and LTRPP performance cycle, including the number of shares awarded and delivered, following the application of the payout factor and the addition of dividend equivalent shares.

2016-2018 performance cycle LTPP

	PSUs at grant			Shares delivered at vesting				
	PSUs (target number)	PSUs (target value at grant date) (CHF) [2]	Payout factor for LTPP (% of target)	Performance shares delivered at vesting (number)	Performance shares delivered at vesting (value at vesting date) (CHF) [3]	Dividend equivalent shares delivered at vesting (number) [4]	Dividend equivalent shares delivered at vesting (value at vesting date) (CHF)	Total shares delivered at vesting (value at vesting date) (CHF)
Executive Committee members active on December 31, 2018								
Vasant Narasimhan (CEO from February 1, 2018) [1]	13 704	1 092 209	136%	18 637	1 642 665	1 744	153 716	1 796 381
Other 16 Executive Committee members, including the four members who stepped down during financial year 2018 [5]	185 067	14 634 081	124%-142%	251 021	22 013 199	23 569	2 066 775	24 079 974
Total	198 771	15 726 290		269 658	23 655 864	25 313	2 220 491	25 876 355

[1] Vasant Narasimhan, Shannon Thyme Klinger, Stefan Lang and André Wyss joined the Executive Committee during the course of the performance period 2016-2018. As such, the information disclosed reflects their pro-rata LTPP 2016-2018 payout attributable to the period they were a member of the Executive Committee. Elizabeth Barrett, Bertrand Bodson, Paul Hudson, Klaus Moosmayer, John Tsai and Robert Weltevreden joined post the 2016 LTPP awards being made and hence did not receive an LTPP award for the 2016-2018 performance period.

[2] The shown amounts represent the underlying share value of the target number of PSUs granted to each Executive Committee member for the performance period 2016-2018, based on the closing share price on the grant date (January 20, 2016) of CHF 79.70 per Novartis share and USD 80.49 per ADR.

[3] The shown amounts represent the underlying share value of the target number of PSUs vested for the performance period 2016-2018, based on the last closing share price before the vesting date (i.e., January 22, 2019) of CHF 88.14 per Novartis share and USD 88.32 per ADR.

[4] Dividend equivalent shares are calculated on the dividend each member of the Executive Committee would have received, based on the actual number of shares delivered at the end of the performance period 2016-2018. At vesting,

the dividend equivalents are credited in shares or ADRs.

[5] Includes the LTPP vesting for the outgoing CEO, General Counsel, CEO of Alcon, and President of Novartis Operations and Country President Switzerland for performance cycle 2016-2018, as per the plan rules. See page 148 for further details.

2016-2018 performance cycle LTRPP

Under the LTRPP, the award made to the CEO of 4 569 PSUs, and the aggregate award of 96 143 PSUs made to the other Executive Committee members (including those who stepped down during the year) were forfeited, resulting in no payout, due to the Company's TSR over the three-year performance period ranking 11 out of 13 peer companies.

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The table and information below provide details of the 2017 realized compensation for the CEO and other Executive Committee members, for comparative purposes.

2017 realized compensation for the CEO and other Executive Committee members

		2017 annual base salary	2017 pension benefits	2017 Annual Incentive[1]		Long-Term Incentives		Other 2017 compensation[2]	
						LTPP 2015-2017 cycle	LTRPP 2015-2017 cycle		
	Currency	Cash (amount)	Amount	Cash	Equity[1]	Equity (value at vesting date)[2]	Equity (value at vesting date)[2]	Amount[3]	Total realized compensation (incl. share price movement)[4]
Executive Committee members active on December 31, 2017									
Joseph Jimenez (CEO)	CHF	2 100 000	166 397	1 968 750	1 968 792	5 068 337	0	72 186	11 344 462
Aggregate realized compensation of the other 10 ECN members	CHF	9 310 740	1 675 398	5 841 107	7 743 069	8 355 739	0	3 248 419	36 174 472
Total[5]	CHF	11 410 740	1 841 795	7 809 857	9 711 861	13 424 076	0	3 320 605	47 518 934

[1] The portion of the Annual Incentive delivered in equity is rounded up to the nearest share, based on the closing share price on the grant date (January 18, 2018) of CHF 82.90 per Novartis share and USD 86.41 per ADR.

[2] The amounts represent the underlying share value of the 160 733 PSUs vesting on January 21, 2018, to the CEO and other Executive Committee members for the performance cycle 2015-2017, inclusive of earned dividend equivalents for the three-year cycle. The value is determined using the closing share price on the last trading day (January 19, 2018) before the vesting date of CHF 83.38 per Novartis share and USD 86.94 per ADR. For two members of the Executive Committee, the vesting value is reported pro-rata based on the period they were an Executive Committee member during the performance cycle.

[3] Includes any other perquisites, benefits in kind, international assignment benefits as per the global mobility policy (e.g., housing, international health insurance, children's school fees, tax equalization)

[4] All amounts are before deduction of the social security contribution and income tax due by the Executive Committee member.

[5] Amounts for Executive Committee members paid in USD were converted at a rate of CHF 1.00 = USD 1.015, which is the same average exchange rate used in the Group's 2017 consolidated financial statements.

Realized compensation for the Executive Committee for 2018 compared to 2017

When comparing 2018 total realized compensation for the Executive Committee, including the CEO, of CHF 66.3 million to the 2017 total realized compensation of CHF 47.5 million, the difference is primarily due to changes in the composition of the Executive Committee. There has been both an increase in the number of Executive Committee members and an overlap of departing and appointed members, including the CEO in 2018.

Compensation at grant value

In accordance with the Swiss Ordinance against Excessive Compensation in Listed Companies, Novartis continues to disclose total compensation at grant value for the CEO and other Executive Committee members. The tables below disclose for the CEO and other Executive Committee members:

- Fixed 2018 compensation (base salary and benefits)
- The actual cash portion and the deferred portion granted in equity of the 2018 Annual Incentive
- LTPP and LTRPP 2018-2020 performance cycle awards, which are reported at target value at grant date under the assumption that the awards will vest at 100% achievement, excluding any share price movement and dividend equivalents that may be accrued over the performance cycle. The future payout will be determined only after the performance cycle concludes in three years (i.e., end of 2020), with a payout range of 0% to 200% of the target value.
- Other compensation for 2018, which includes other benefits and the full amount of compensation for lost entitlements from former employers (buyouts), and compensation during the notice period (between the date of stepping down from the Executive Committee and either December 31 or the end of the contractual notice), either paid in cash or granted in equity in the year

To assess CEO actual pay for performance in 2018, including the Annual Incentive payout for the 2018 performance year and the Long-Term Incentive payouts for the 2016-2018 performance cycle, shareholders should refer to the 2018 realized compensation table on page 151.

2018 compensation at grant value for the CEO and other Executive Committee members

		Fixed compensation and pension benefits		Variable compensation				
		Actual compensation paid or granted for 2018				Long-Term Incentive 2018-2020 cycle grants at target		
	Currency	2018 annual base salary Cash (amount)	2018 pension benefits Amount [1]	2018 Annual Incentive (performance achieved) Cash (amount)	Equity (value at grant date) [2]	LTPP 2018-2020 cycle PSUs (target value at grant date) [3]	LTRPP 2018-2020 cycle PSUs (target value at grant date) [3]	Oth compe A
Executive Committee members active on December 31, 2018								
Vasant Narasimhan (CEO from February 1, 2018) [6]	CHF	1 491 667	168 233	1 594 801	1 594 805	3 100 046	1 937 539	
Steven Baert	CHF	780 000	152 914	585 000	585 073	1 170 051	468 053	
Elizabeth Barrett (from February 1, 2018, to December 31, 2018) [7]	CHF	779 167	174 274	0	0	1 360 040	510 057	2 1
Bertrand Bodson (from April 1, 2018) [8]	CHF	450 000	97 666	216 986	217 001	440 614	110 174	
James Bradner [9]	USD	1 094 462	257 018	924 000	924 004	1 870 085	880 086	
Richard Francis	CHF	850 000	176 368	382 500	382 528	1 360 057	510 001	1 1
Paul Hudson	CHF	985 000	180 771	1 007 325	1 007 352	1 683 036	792 027	
Harry Kirsch	CHF	1 040 000	173 499	858 000	858 043	1 768 008	832 067	
Shannon Thyme Klinger (from April 1, 2018) [8]	CHF	520 833	103 448	275 770	275 790	619 595	185 862	
Steffen Lang (from April 1, 2018) [8]	CHF	540 000	99 535	260 384	260 454	596 631	179 064	
Klaus Moosmayer	CHF	41 667	9 704	16 986	17 011	0	0	8

(from December 1, 2018)								
John Tsai (from May 1, 2018)	CHF	566 667	126 845	313 801	313 867	0	0	4 5
Robert Weltevreden (from June 1, 2018)	CHF	350 000	70 950	77 392	232 337	671 702	155 003	
Subtotal		9 464 855	1 785 446	6 492 171	6 647 490	14 597 819	6 540 145	10 4
Executive Committee members who stepped down during 2018 [10]								
Joseph Jimenez (CEO until January 31, 2018)	CHF	178 601	19 146	133 767	0	0	0	2 3
F. Michael Ball (until June 30, 2018) [9]	USD	555 397	126 594	333 238	333 231	888 640	388 845	2 9
Felix R. Ehrat (until May 31, 2018)	CHF	384 740	68 918	153 896	153 892	654 081	230 877	2 3
André Wyss (until March 31, 2018) [11]	CHF	217 582	45 646	216 986	0	116 060	43 523	1 3
Subtotal		1 323 833	257 458	830 395	479 632	1 638 802	654 503	8 9
Total		10 788 688	2 042 904	7 322 566	7 127 122	16 236 621	7 194 648	19 4

Based on assumption of 100% payout at target. Actual payout (0-200% of target) will be known at the end of the three-year cycle in January 2021.

See the next page for 2017 comparative figures.

[1] Includes mandatory employer contributions of CHF 4 336 for the CEO and CHF 78 403 for the other Executive Committee governmental social security systems. This amount is out of total employer contributions of CHF 2 847 422 paid in 2018 for all members, and provides a right to the maximum future insured government pension benefit for the Executive Committee membe

[2] The portion of the Annual Incentive delivered in equity is rounded up to the nearest share, based on the closing share price o 2019) of CHF 88.14 per Novartis share and USD 88.32 per ADR.

[3] The amounts represent the underlying share value of the target number of PSUs granted to Executive Committee members f 2018-2020, based on the closing share price on the grant date (January 18, 2018) of CHF 82.90 per Novartis share and USD 86 except Elizabeth Barrett and Robert Weltevreden. For Ms. Barrett and Mr. Weltevreden, the closing share price on the grant da 83.52 on February 1, 2018, and CHF 74.70 on June 1, 2018, per Novartis share.

[4] Includes any other perquisites, benefits in kind, and international assignment benefits as per the global mobility policy (e.g., insurance, children's school fees, tax equalization)

[5] All amounts are before deduction of the social security contribution and income tax due by the Executive Committee membe
[6] The figures include Vasant Narasimhan's compensation of January 2018 as Head of Global Drug Development.
[7] Elizabeth Barrett stepped down from the role of CEO, Novartis Oncology and from the Executive Committee as at the end o
LTPP and LTRPP grants (16 284 and 6 107 PSUs, respectively) for the 2018-2020 performance cycle, and the 2018 buyout aw
shares, reflected in other compensation, both included in the table above, were forfeited in full upon her departure on Decembe
[8] For those members who joined the Executive Committee in 2018, the information under the columns “2018 annual base sala
“2018 Annual Incentive,” “LTPP” and “LTRPP” includes their pro-rata compensation from the date they joined the Executive
[9] Amounts in USD for F. Michael Ball and James Bradner were converted at a rate of CHF 1.00 = USD 0.978, which is the sa
used in the Group's 2018 consolidated financial statements.
[10] For those members who left the Executive Committee in 2018, the information under the columns “2018 annual base salary,
Annual Incentive,” “LTPP” and “LTRPP” reflects the pro-rata compensation for the period they were an Executive Committee
under the column “Other 2018 compensation” also includes, inter alia, their pro-rata compensation from the date they stepped d
Committee to December 31, 2018. More information regarding Executive Committee members who stepped down during 2018
[11] The full number of PSUs under LTPP and LTRPP 2018-2020 granted to André Wyss were 16 985 and 6 370, respectively. T
LTPP and LTRPP in the table above are disclosed on a pro-rata basis to the end of his notice period (i.e., September 30, 2018),
and subject to the plan rules.

2017 compensation at grant value for the CEO and other Executive Committee members

For comparative purposes, the table below provides the compensation at grant value for 2017.

		Fixed compensation and pension benefits		Variable compensation				
		Actual compensation paid or granted for 2017				Long-Term Incentive 2017-2019 cycle grants at target		
	Currency	2017 annual base salary Cash (amount)	2017 pension benefits Amount [1]	2017 Annual Incentive (performance achieved) Cash	Equity (value at grant date) [2]	LTPP 2017-2019 cycle PSUs (target value at grant date) [3]	LTRPP 2017-2019 cycle PSUs (target value at grant date) [3]	Othe compe
Executive Committee members active on December 31, 2017 [6]								
Joseph Jimenez (CEO)	CHF	2 100 000	166 397	1 968 750	1 968 792	4 200 018	2 625 038	
F. Michael Ball	USD	1 120 000	203 546	873 600	873 605	1 792 047	784 043	2
Steven Baert	CHF	775 000	154 652	663 000	663 034	1 170 069	468 056	1
James Bradner	USD	1 066 385	117 394	898 800	898 837	1 819 043	856 033	
Felix R. Ehrat	CHF	928 333	137 334	223 200	892 833	1 581 045	558 028	
Richard Francis	CHF	841 667	176 362	425 000	425 028	1 360 002	510 010	1 1
Paul Hudson	CHF	958 333	203 485	950 400	950 449	1 536 023	672 046	1
Harry Kirsch	CHF	1 038 333	153 854	800 800	800 814	1 768 053	832 012	
Vasant Narasimhan	CHF	841 667	168 562	807 500	807 529	1 360 002	510 010	
Bruno Strigini (until December 31, 2017) [6]	CHF	898 333	210 613	225 000	225 074	1 440 057	540 048	
André Wyss	CHF	875 000	154 339	0	1 232 060	1 408 021	528 061	
Total [7]	CHF	11 410 740	1 841 795	7 809 857	9 711 861	19 381 014	8 859 147	2 0

Based on assumption of 100% payout at target. Actual payout (0-200% of target) will be known at the end of the three-year cycle in

January 2020.

[1] Includes mandatory employer contributions of CHF 4 336 for the CEO and CHF 50 227 for the other Executive Committee governmental social security systems. This amount is out of total employer contributions of CHF 2 710 445 paid in 2017 for all members, and provides a right to the maximum future insured government pension benefit for the Executive Committee membe

[2] The portion of the Annual Incentive delivered in equity is rounded up to the nearest share, based on the closing share price o 2018) of CHF 82.90 per Novartis share and USD 86.41 per ADR.

[3] The amounts represent the underlying share value of the target number of PSUs granted to Executive Committee members f 2017-2019, based on the closing share price on the grant date (January 17, 2017) of CHF 71.35 per Novartis share and USD 71

[4] Includes any other perquisites, benefits in kind, and international assignment benefits as per the global mobility policy (e.g., insurance, children's school fees, tax equalization)

[5] All amounts are before deduction of the social security contribution and income tax due by the Executive Committee membe

[6] Bruno Strigini stepped down from the Executive Committee at the end of the 2017 business year. The LTPP and LTRPP gra performance cycle, included in the table above, will vest at the end of the performance cycle on a pro-rata basis per his contract the plan rules.

[7] Amounts in USD for F. Michael Ball and James Bradner were converted at a rate of CHF 1.00 = USD 1.015, which is the sa used in the Group's 2017 consolidated financial statements.

Compensation at grant value for the Executive Committee for 2018 compared to 2017

When comparing the Executive Committee 2018 total compensation at grant value of CHF 70.2 million to the 2017 total compensation at grant value of CHF 61.0 million, the difference is primarily due to the awards granted in 2018 to external newly appointed members of the Executive Committee – Elizabeth Barrett, John Tsai and Klaus Moosmayer – as part of their buyout packages when joining Novartis in 2018. However, Elizabeth Barrett forfeited compensation amounting to CHF 3.7 million composed of her equity buyout (CHF 1.8 million) and her LTPP and LTRPP grants for the 2018-2020 performance cycle (CHF 1.9 million), as she stepped down from the Executive Committee on December 31, 2018. See page 150 for further details on the changes to the composition of the Executive Committee in 2018.

Additional disclosures for the CEO and other Executive Committee members

This section provides additional disclosures, including information about the shareholdings of the CEO and the other Executive Committee members.

Former Alcon CEO one-off performance award update

To avoid any conflict of interest following news of the intention to spin off Alcon, the former Alcon CEO, F. Michael Ball, gave notice to retire from his role and stepped down from the Executive Committee on July 1, 2018, commencing his 12-month contractual notice period that will end on the Alcon spin-off date (or June 30, 2019, if later). During the notice period, Mr. Ball is serving as Chairman-Designate of Alcon, reporting to Vasant Narasimhan and focusing on preparing Alcon for the intended spin-off. In this role, Mr. Ball supports the newly appointed Alcon CEO to ensure that the turnaround of the Alcon business continues to accelerate, and that the company will be in a strong position to operate as an independent entity. The Alcon CEO role does not sit on the Novartis Executive Committee given the potential conflict of interest.

As disclosed in the 2016 Compensation Report, Mr. Ball received a one-off award of 50 000 performance share units in February 2016 when he joined Novartis, subject to the achievement of targets linked to the turnaround of Alcon during the 2016-2018 performance cycle.

In line with his contractual terms, this one-off award will vest in early 2019, subject to performance outcomes versus the targets set. The performance measures are based on financial and non-financial targets, including sales growth ahead of peers, core operating income growth ahead of sales growth, core operating income margin at least in line with the average of peers, and the successful launch of new products.

In 2016, performance was tracking below target. However, in 2017 and 2018, Alcon began to close the gap versus the targets. Given that some of the performance measures are assessed relative to peers, the achievements and the final payout of this three-year Long-Term Incentive award will be disclosed in the 2019 Compensation Report, once the final performance is known.

Malus and clawback

Any incentive compensation paid to Executive Committee members is subject to malus and clawback rules. This means that the Board for the CEO, and the Compensation Committee for the other Executive Committee members, may decide – subject to applicable law – to retain any unpaid or unvested incentive compensation (malus), or to recover incentive compensation that has been paid or has vested in the past (clawback). This applies in cases where the payout conflicts with internal management standards, including Company and accounting policies, or violates laws. This principle applies to both the short-term Annual Incentive and Long-Term Incentive plans.

In 2018, there was no legal or factual basis on which to exercise malus or clawback for current or former Executive Committee members. However, the Compensation Committee and the Board of Directors decided to apply its discretion, as foreseen in the plan rules, to reduce the 2018 Annual Incentive to below-target levels for certain executives in relation to their responsibilities.

Number of equity instruments granted to the CEO and other Executive Committee members for financial year 2018

	Variable compensation[1]			
	2018 Annual Incentive (performance achieved)	LTPP 2018-2020 cycle	LTRPP 2018-2020 cycle	Other
	Equity (number)[2]	PSUs (target number)[3]	PSUs (target number)[3]	Equity/PSUs (number)
Executive Committee members active on December 31, 2018				
Vasant Narasimhan (CEO from February 1, 2018)	18 094	37 395	23 372	0
Steven Baert	6 638	14 114	5 646	0
Elizabeth Barrett (from February 1, 2018, to December 31, 2018)[4]	0	16 284	6 107	21 267
Bertrand Bodson (from April 1, 2018)	2 462	5 315	1 329	0
James Bradner	10 462	21 642	10 185	0
Richard Francis	4 340	16 406	6 152	0
Paul Hudson	11 429	20 302	9 554	0
Harry Kirsch	9 735	21 327	10 037	0
Shannon Thyme Klinger (from April 1, 2018)	3 129	7 474	2 242	0
Steffen Lang (from April 1, 2018)	2 955	7 197	2 160	0
Klaus Moosmayer (from December 1, 2018)	193	0	0	8 857
John Tsai (from May 1, 2018)	3 561	0	0	27 381
Robert Weltevreden (from June 1, 2018)	2 636	8 992	2 075	0
Subtotal	75 634	176 448	78 859	57 505
Executive Committee members who stepped down during 2018				
Joseph Jimenez (CEO until January 31, 2018)[5]	0	0	0	0
F. Michael Ball (until June 30, 2018)	7 609	10 284	4 500	18 865
Felix R. Ehrat (until May 31, 2018)	4 221	7 890	2 785	17 603
André Wyss (until March 31, 2018)[6]	0	1 400	525	3 915
Subtotal	11 830	19 574	7 810	40 383
Total	87 464	196 022	86 669	97 888

See the next page for 2017 comparative figures.

[1] The values of the awards are reported in the table "2018 compensation at grant value for the CEO and other Executive Committee members" on page 155.

[2] Vested shares, restricted shares and/or RSUs granted under the Annual Incentive for performance period 2018

[3] Target number of PSUs granted under the LTPP and LTRPP as applicable for the performance cycle 2018-2020

[4] Elizabeth Barrett stepped down from the role of CEO, Novartis Oncology and from the Executive Committee as at the end of the 2018 business year. The LTPP and LTRPP grants (16 284 and 6 107 PSUs, respectively) for the 2018-2020 performance cycle, and the 2018 buyout award of 21 267 performance shares, reflected in other compensation, both included in the table above, were forfeited in full upon her departure on December 31, 2018.

[5] Joseph Jimenez received his 2018 Annual Incentive 100% in cash and was not granted LTPP and LTRPP awards for the performance cycle 2018-2020.

[6] André Wyss stepped down from the Executive Committee on March 31, 2018, and ended his notice period on September, 30 2018. He received his 2018 Annual Incentive 100% in cash on a pro-rata basis, and the LTPP and LTRPP grants for the 2018-2020 performance cycle, included in the table above, will vest at the end of the performance cycle on a pro-rata basis per his contractual agreement and subject to the plan rules.

Number of equity instruments granted to the CEO and other Executive Committee members for financial year 2017 (comparative information)

	Variable compensation[1]		
	2017 Annual Incentive (performance achieved)	LTPP 2017-2019 cycle	LTRPP 2017-2019 cycle
	Equity (number)[2]	PSUs (target number)[3]	PSUs (target number)[3]
Executive Committee members active on December 31, 2017			
Joseph Jimenez (CEO)	23 749	58 865	36 791
Steven Baert	7 998	16 399	6 560
F. Michael Ball	10 110	24 893	10 891
James Bradner	10 402	25 268	11 891
Felix R. Ehrat	10 770	22 159	7 821
Richard Francis	5 127	19 061	7 148
Paul Hudson	11 465	21 528	9 419
Harry Kirsch	9 660	24 780	11 661
Vasant Narasimhan	9 741	19 061	7 148
Bruno Strigini (until December 31, 2017)[4]	2 715	20 183	7 569
André Wyss	14 862	19 734	7 401
Total	116 599	271 931	124 300

[1] The values of the awards are reported in the table "2017 compensation at grant value for the CEO and other Executive Committee members" on page 156.

[2] Vested shares, restricted shares and/or RSUs granted under the Annual Incentive for performance period 2017

[3] Target number of PSUs granted under the LTPP and LTRPP as applicable for the performance cycle 2017-2019

[4] Bruno Strigini stepped down from the Executive Committee at the end of the 2017 business year. The LTPP and LTRPP grants for the 2017-2019 performance cycle, included in the table above, will vest at the end of the performance cycle on a pro-rata basis per his contractual agreement and subject to the plan rules.

Share ownership requirements for the CEO and other Executive Committee members

Executive Committee members are required to own at least a minimum multiple of their annual base salary in Novartis shares or restricted share units (RSUs) within five years of hire or promotion, as set out in the table below. In the event of a substantial rise or drop in the share price, the Board of Directors may, at its discretion, amend that time period accordingly.

Function	Ownership level
CEO	5 x base compensation
Other Executive Committee members	3 x base compensation

The determination of equity amounts against the share ownership requirements is defined to include vested and unvested Novartis shares or American Depositary Receipts (ADRs), and RSUs acquired under the Company's compensation plans. However, unvested matching shares granted under former matching programs, such as the Leveraged Share Savings Plan (LSSP) and the Employee Share Ownership Plan (ESOP), and any unvested PSUs are excluded. The determination also includes other shares and vested options of Novartis shares or ADRs that are owned directly or indirectly by "persons closely linked" to an Executive Committee member. The Compensation Committee reviews compliance with the share ownership guideline on an annual basis.

Shares, ADRs and other equity rights owned by Executive Committee members at December 31, 2018[1]

The following table shows, in alphabetical order after the CEO, the total number of shares, ADRs and other equity rights owned by the CEO and the other Executive Committee members and "persons closely linked" to them as of December 31, 2018. As of December 31, 2018, no members of the Executive Committee, either individually or together with "persons closely linked" to them, owned 1% or more of the outstanding shares or ADRs of Novartis. As of December 31, 2018, all members who have served at least five years on the Executive Committee have met or exceeded their personal Novartis share ownership requirements.

	Vested shares and ADRs	Unvested shares and other equity rights[2]	Equity ownership level as a multiple of annual base salary[3]	Unvested target PSUs (e.g., LTPP/LTRPP)[4]	Matching shares under the LSSP[5]	Total at December 31, 2018
Vasant Narasimhan (CEO from February 1, 2018)	25 240	57 111	4x	56 552	4 192	143 095
Steven Baert	23 365	22 598	4x	39 461	0	85 424
Elizabeth Barrett (from February 1, 2018, to December 31, 2018)[6]	0	0	0x	0	0	0
Bertrand Bodson (from April 1, 2018)	0	4 600	0x	3 914	0	8 514
James Bradner	924	22 193	1x	67 997	0	91 114
Richard Francis	48 079	19 937	6x	47 078	0	115 094
Paul Hudson	16 756	32 589	4x	30 585	0	79 930
Harry Kirsch	97 081	29 488	10x	67 058	3 756	197 383
Shannon Thyme Klinger (from April 1, 2018)	14 007	21 705	4x	16 722	1 684	54 118
Steffen Lang (from April 1, 2018)	23 793	14 743	4x	14 747	4 087	57 370
Klaus Moosmayer (from December 1, 2018)	0	0	0x	3 274	0	3 274
John Tsai (from May 1, 2018)	6 429	16 432	2x	2 202	0	25 063
Robert Weltevreden (from June 1, 2018)	150	0	0x	3 690	0	3 840
Total[7]	255 824	241 396		353 280	13 719	864 219

[1] Includes holdings of "persons closely linked" to Executive Committee members (see definition on page 161)

[2] Includes unvested shares and ADRs as well as other equity rights applicable for the determination of equity

amounts for the share ownership requirements, as per the definition above

[3] The multiple is calculated based on the full-year annual base salary and the closing share price as at the end of the 2018 financial year. The share price on the final trading day of 2018 was CHF 84.04 / USD 85.81 as at December 31, 2018.

[4] The target number of PSUs is disclosed pro-rata to December 31, 2018, unless the award qualified for full vesting under the relevant plan rules.

[5] Matching shares under the Leveraged Share Savings Plan (LSSP) are disclosed pro-rata to December 31, 2018, unless the award qualified for full vesting under the plan rules. LSSP participation for Executive Committee members ceased in 2014, and no new LSSP awards have been made since then. Outstanding awards will vest five years from the grant date, subject to the LSSP plan rules.

[6] Elizabeth Barrett stepped down from the role of CEO, Novartis Oncology and from the Executive Committee as at the end of the 2018 business year. The LTPP and LTRPP grants (16 284 and 6 107 PSUs, respectively) for the 2018-2020 performance cycle, and the 2018 buyout award of 21 267 performance shares were forfeited in full upon her departure on December 31, 2018.

[7] Joseph Jimenez, F. Michael Ball, Felix Ehrat and André Wyss stepped down from the Executive Committee in 2018. At the time they stepped down from the Executive Committee, Mr. Jimenez owned 4 750 vested shares, and 244 297 unvested shares and other equity rights; Mr. Ball owned no vested shares, and 165 810 unvested shares and other equity rights; Mr. Ehrat owned 236 886 vested shares, and 114 038 unvested shares and other equity rights; and Mr. Wyss owned 81 347 vested shares and 49 344 unvested shares and other equity rights.

Fixed and variable compensation

The CEO and other Executive Committee members' annual base salary and variable compensation mix at grant value for financial year 2018:

	Annual base salary [1]	Variable compensation [2]
Vasant Narasimhan (CEO)	15.3%	84.7%
Steven Baert	21.7%	78.3%
Elizabeth Barrett	29.4%	70.6%
Bertrand Bodson	31.4%	68.6%
James Bradner	19.2%	80.8%
Richard Francis	24.4%	75.6%
Paul Hudson	18.0%	82.0%
Harry Kirsch	19.4%	80.6%
Shannon Thyme Klinger	27.7%	72.3%
Steffen Lang	29.4%	70.6%
Klaus Moosmayer	55.1%	44.9%
John Tsai	47.4%	52.6%
Robert Weltevreden	23.5%	76.5%
Total [3]	21.6%	78.4%

[1] Excludes pension and other benefits

[2] See table "2018 compensation at grant value for the CEO and other Executive Committee members" on page 155 with regard to the disclosure principles of variable compensation.

[3] Excludes Joseph Jimenez, F. Michael Ball, Felix Ehrat and André Wyss, who stepped down from the Executive Committee during 2018

Other payments to Executive Committee members

During 2018, no other payments or waivers of claims other than those set out in the tables (including their footnotes) contained in this Compensation Report were made to Executive Committee members or to "persons closely linked" to them.

Payments to former Executive Committee members

Under the former Executive Committee members' contracts and in line with the Company's Long-Term Incentive plan rules, payments were made to four former members totaling CHF 8 884 095. One former Executive Committee member who stepped down in 2017 received payments during the contractual notice period in 2018 of salary, pension and other benefits, and an Annual Incentive totaling CHF 2 096 154 per the employment contract.

Two former members received payments totaling CHF 6 287 264 in line with the Company's Long-Term Incentive plan rules. The payments related to the vesting of LTPP for the 2016-2018 performance cycle, based on actual performance outcomes plus dividend equivalents. No payments were or will be made for the 2016-2018 LTRPP performance cycle.

In addition, in line with the Company's global mobility policy, during 2018, one former member received a tax equalization payment of CHF 517 474 related to incentive compensation granted during an international assignment.

Also, four former members received other benefits, for example tax return services, totaling CHF 189 737.

No other payments (or waivers of claims) were made to former Executive Committee members or to "persons closely linked" to them during 2018.

Loans to Executive Committee members

Our policy does not allow loans to be granted to current or former members of the Executive Committee or to "persons closely linked" to them. Therefore, no loans were granted in 2018, and none were outstanding as of December 31, 2018.

Persons closely linked

“Persons closely linked” are (i) their spouse, (ii) their children below age 18, (iii) any legal entities that they own or otherwise control, and (iv) any legal or natural person who is acting as their fiduciary.

Note 26 to the Group’s audited consolidated financial statements

The total expense for the year for compensation awarded to Executive Committee and Board members, using International Financial Reporting Standards (IFRS) measurement rules, is presented in Note 26 to the Group’s audited consolidated financial statements.

Award and delivery of equity to Novartis associates

During 2018, 14.4 million unvested restricted shares (or ADRs), RSUs and target PSUs were granted, and 10.7 million Novartis vested shares (or ADRs) were delivered to Novartis associates under various equity-based participation plans. Current unvested equity instruments (restricted shares, RSUs and target PSUs) and outstanding equity options held by associates represent 1.82% of issued shares. Novartis delivers treasury shares to associates to fulfill these obligations, and aims to offset the dilutive impact from its equity-based participation plans.

2019 Executive Committee compensation system

Each year the Executive Committee compensation system is reviewed by the Board of Directors and Compensation Committee to ensure it remains closely aligned with business needs and evolving best practice compensation principles, while also taking into consideration feedback from dialogue with shareholders.

The Board of Directors and the Compensation Committee decided to focus the 2018 review on the structure and performance measures of the Long-Term Incentive plans, taking into account a desire for simplification and the principle of compensating executives more directly on performance linked to our strategic priorities of accelerating top- and bottom-line growth.

Annual Incentive

The Compensation Committee decided to maintain the Annual Incentive structure and the balanced scorecard approach following the changes announced last year, as they continue to align with the key strategic priorities. Values and Behaviors also remain a key component of the Annual Incentive and are embedded in our culture. As such, members of the Executive Committee are expected to demonstrate these to the highest standards.

For 2019, the CEO balanced scorecard will be as follows:

CEO Balanced Scorecard - Key Metrics

Financial targets - 60% of total Annual Incentive, comprising:

Group net sales (30%)

Group operating income (30%)

Group free cash flow (as % of sales) (20%)

Share of peers for Novartis Group (20%)

Strategic objectives - 40% of total Annual Incentive, comprising:

Innovation (20%)

Operational excellence (20%)

Data and digital (20%)

People and culture (20%) (including Values and Behaviors)

Building trust with society (20%) (including access to healthcare and reputation)

The payout schedule for the Annual Incentive will also remain unchanged, as follows:

Performance	Payout
Outstanding	170%–200%
Exceeds expectations	130%–160%
Meets expectations	80%–120%
Partially meets expectations	40%–70%
Below expectations	0%–30%

Long-Term Incentive

Following a thorough evaluation and review of the Long-Term Incentive plan, the Compensation Committee approved the change from two Long-Term Incentive plans to a single Long-Term Incentive plan for performance cycles beginning in 2019 onward. The performance measures presented below, each with an equal weighting, have been chosen as the most appropriate measures to best support the objective of transforming Novartis into a leading, focused innovative medicines company over the long term. There will be no increase in target opportunity as a percentage of annual base salary for the CEO and most other members of the Executive Committee (exceptions are on page 164).

THREE-YEAR PERFORMANCE MEASURES	WEIGHTING
Net sales, CAGR [1]	25%
Core operating income, CAGR [1]	25%
Innovation	25%
Relative TSR	25%

1. CAGR = compound annual growth rate

Financial measures: net sales CAGR and core operating income CAGR

The Compensation Committee has determined that the appropriate financial measures to replace NCVA for the 2019-2021 performance cycle are net sales growth and core operating income growth. These are simpler, more

transparent measures, which will better align the Long-Term Incentive with the evolving Group strategic imperatives of accelerating growth and margin expansion to drive long-term value.

The net sales growth and core operating income growth targets will be based on the Novartis three-year strategic plan, taking into account peer growth and external consensus levels, and will be set at the beginning of each performance cycle. Actual performance will then be assessed at the end of the three-year performance cycle against these targets. Core operating income is a non-IFRS measure, and its definition can be found on page 109 of this Annual Report.

Payout levels will range from 0% to 200% of target opportunity. A formulaic payout schedule will apply to three payout ranges: 40% to 80%, 80% to 120%, and 120% to 200% of target opportunity. For 80% to 120% payout, a ±1% net sales CAGR and ±2% core operating income CAGR range around the performance targets will apply. Between 40% to 80% and 120% to 200% payout, the slope will be two times steeper to penalize or reward material under or over performance, respectively. There will be no payout below 40% of target opportunity.

The committee will review performance outcomes in the context of overall business performance and the healthcare industry as a whole. In certain circumstances, the committee can apply discretion to adapt payout lev-

els, to ensure there is appropriate alignment between payout levels and overall Company performance for the relevant period. Where discretion is applied, the committee will explain the rationale in the relevant Compensation Report.
The Compensation Committee considered the use of another return-based performance measure and determined that it is not appropriate at this time. This is to ensure that decisions on research and development and future acquisitions and divestments are based on long-term value creation.

Innovation

The innovation performance measure aligns with the Novartis mission to reimagine medicine to improve and extend people's lives. To simplify the assessment of this objective, innovation targets will be set in relation to eight to 10 key research and development programs. The payout ranges remain unchanged, with 0% to 150% payout for the achievement of the target milestones, and 150% to 200% of target for truly exceptional performance.

Relative TSR

Relative TSR continues to play an important role in assessing our performance versus the external market. Therefore, the Compensation Committee elected to retain relative TSR within the new single plan Long-Term Incentive structure. Relative TSR will continue to be assessed against our global healthcare peer group companies. The payout ranges are unchanged and summarized below.

Novartis position in the peer group	Payout range (% of target)
Positions 1–2	170%–200%
Positions 3–5	130%–160%
Positions 6–8	80%–120%
Positions 9–16	0%

Additional information

Performance shares granted under the Long-Term Incentive do not carry voting rights but do carry dividend equivalents that are paid in shares at the end of the performance period.
There will be pro-rata vesting for all departing Executive Committee members who are considered "good leavers" (including those who are retiring) for Long-Term Incentive awards granted from 2019 onward, as announced in last year's Compensation Report. There will continue to be malus and clawback, applicable to any incentive compensation paid to Executive Committee members.

Disclosure of performance targets

The three-year forward-looking targets will be disclosed to shareholders at the end of the performance cycle. Disclosing these long-term targets before the end of the relevant performance cycle would give substantial insight into the Company's confidential strategies and could place the Company and its shareholders at a competitive disadvantage. Therefore, prospective disclosure was not preferred.
We understand that with this approach, the shareholder cannot assess performance targets until the performance cycle has ended. To mitigate this, throughout each cycle, we will provide information on how financial and innovation performance is tracking against the targets set at the beginning of the cycles. We will also provide a yearly relative TSR performance update.

2019 Executive Committee compensation

2019 Executive Committee total compensation changes

All Executive Committee members, except those outlined below, were awarded increases of between 0% and 3%. For context, the average of all Novartis employee annual base salary increases was 1.3% in Switzerland and 3% in the US. Consistent with our Executive Committee appointments compensation policy (see page 141), the members outlined below were appointed to the Executive Committee in recent years with total target compensation below external market median level. The total target compensation for these members has been assessed, and increases in line with proven performance have been made, as disclosed below.

Vasant Narasimhan, CEO

Vasant Narasimhan quickly established himself as CEO. He delivered a good first year of financial results and initiated many activities, which have already had an impact on the Company performance and its culture. Dr. Narasimhan was appointed on a salary significantly below that of his predecessor and the market, with the intention (communicated in last year's Compensation Report) to increase his compensation to a more competitive level, subject to strong performance and proven ability in the role. This prudent approach is in line with our reward principles for Executive Committee members and all other associates. Given this context, Dr. Narasimhan will receive an annual base salary increase of 8% as from March 1, 2019 (from CHF 1 550 000 to CHF 1 674 000). There will be no change to his target Annual Incentive and his target Long-Term Incentive (325% of base salary in total). Overall, his 2019 total target compensation will be increased by 8% compared to 2018.

Paul Hudson, CEO, Novartis Pharmaceuticals

During 2018, Paul Hudson delivered above-target performance against his financial targets, led cross-functional transformation in launch excellence, scaled pioneering efforts in digital, and drove culture change. Mr. Hudson will receive an annual base salary increase of 4% as from March 1, 2019, and his target Long-Term Incentive will be increased from 250% of annual base salary to 270% of annual base salary as from 2019. There will be no change to his Annual Incentive target. Overall, his 2019 total target compensation will be increased by 8.6% compared to 2018.

Shannon Thyme Klinger, Group General Counsel

Shannon Thyme Klinger was appointed on a package significantly below that of her predecessor and the market. It was the Compensation Committee's intention to increase her compensation to a more competitive level, subject to strong performance. Ms. Klinger delivered a very strong contribution in her role. She launched an important strategic and functional transformation of the legal team, managed critical mergers and acquisitions and led culture change. Ms. Klinger will therefore receive an annual base salary increase of 14.3% as from March 1, 2019 (from CHF 700 000 to CHF 800 000), and her target Long-Term Incentive will be increased from 180% of annual base salary to 200% of annual base salary as from 2019. There will be no change to her Annual Incentive. Overall, her 2019 total target compensation will be increased by 20.5%.

Steffen Lang, Global Head of Novartis Technical Operations and Quality

During 2018, Steffen Lang delivered on the technical operations transformation, financial targets and new technologies. Mr. Lang will receive an annual base salary increase of 4.2% as from March 1, 2019. There will be no change to his Annual Incentive and his Long-Term Incentive targets.

Susanne Schaffert, CEO, Novartis Oncology

Susanne Schaffert was promoted internally to CEO, Novartis Oncology, and became a member of the Novartis Executive Committee as of January 1, 2019. Her annual base salary is CHF 850 000, her target Annual Incentive is 100% of base salary, and her target Long-Term Incentive is 220% of base salary.

Alcon spin-off equity restoration plan

If and when the Alcon spin-off occurs in the first half of 2019, holders of unvested awards in the form of restricted Novartis shares will receive a dividend in kind resulting from the spin-off. Holders of unvested RSUs and PSUs will not receive the dividend in kind resulting from the spin-off. Consequently, RSUs and PSUs held by Novartis employees – including the members of the Executive Committee – will be devalued, as they do not participate in the distribution. To compensate for the lost value, Novartis will grant equity awards (called Keep Whole awards) to its employees, including the Executive Committee members, following the spin-off. This will be done in accordance with the Alcon equity restoration plan, as follows:

• The Keep Whole awards will have a value equivalent to the value of the dividend in kind resulting from the spin-off that each award would have received had it been a Novartis share.

• The Keep Whole awards will be granted in the same equity instrument (i.e., PSUs or RSUs) and will have the same vesting terms and performance conditions (if applicable) as the underlying award.

• The Keep Whole awards aim to ensure that Novartis employees who have been granted RSUs or PSUs, including Executive Committee members, are not disadvantaged by the spin-off relative to Novartis shareholders.

2018 Board compensation

Philosophy and benchmarking

Aligned with market practice in Switzerland, the Board of Directors sets compensation for its members at a level that allows for the attraction of high-caliber individuals, including both Swiss and international members, who have global experience.

Board members do not receive variable compensation, in line with their focus on corporate strategy, supervision and governance. Each year at the AGM, shareholders are requested to approve, in a binding vote, the total compensation of the Board until the following AGM.

The Board of Directors sets the level of compensation for its Chairman and the other members to be in line with relevant benchmark companies, which include other large Switzerland-based multinational companies: ABB, Credit Suisse, Lafarge Holcim, Nestlé, Roche and UBS. This peer group was chosen for Board of Directors compensation due to the comparability of Swiss legal requirements, including broad personal and individual liabilities under Swiss law (and new criminal liability under Swiss rules regarding Board of Directors and Executive Committee compensation related to the Ordinance against Excessive Compensation in Listed Companies), and under US law (due to the Company's secondary listing on the New York Stock Exchange). The Board of Directors reviews the compensation of its members, including the Chairman, each year based on a proposal by the Compensation Committee and on advice from its independent advisor, including relevant benchmarking information. The peer group used for the Board of Directors is different than that used for the Executive Committee to ensure independence of decision-making.

Chairman of the Board

As Chairman, Joerg Reinhardt receives total annual compensation valued at CHF 3.8 million. The total compensation is comprised equally of cash and shares, as follows:

• Cash compensation: CHF 1.9 million per year

• Share compensation: annual value equal to CHF 1.9 million of unrestricted Novartis shares

For 2018, the Chairman voluntarily waived the increase in compensation to which he is contractually entitled, which is an amount not lower than the average annual compensation increase awarded to associates based in Switzerland (1.3% for 2018).

Other Board members

The annual fee rates for Board membership and additional functions are included in the table below. These were approved by the Board of Directors with effect from the 2018 AGM. Aggregate Board compensation is aligned with other large Swiss companies.

CHF 000s	AGM 2018-2019 annual fee
Chairman of the Board	3 800
Board membership	280
Vice Chairman	50
Chair of the Audit and Compliance Committee	130
Chair of the Compensation Committee	90
Chair of the following committees: • Governance, Nomination and Corporate Responsibilities Committee • Research & Development Committee • Risk Committee	70
Membership of the Audit and Compliance Committee	70
Membership of the following committees: • Compensation Committee • Governance, Nomination and	

Corporate Responsibilities Committee
• Research & Development Committee
• Risk Committee 40

In addition, the following policies apply regarding Board compensation:
• 50% of compensation is delivered in cash, paid on a quarterly basis in arrears. Board members may choose to receive more of their compensation in shares instead of cash.
• At least 50% of compensation is delivered in shares in two installments: one six months after the AGM, and one 12 months after the AGM.
Board members bear the full cost of their employee social security contributions, if any, and do not receive share options or pension benefits.
2019 Board compensation
The Board of Directors compensation system and fee levels will remain unchanged in 2019.
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Board member total compensation earned for the financial year 2018

	Board membership	Audit and Compliance Committee	Compensation Committee	Governance, Nomination and Corporate Responsibilities Committee	Research & Development Committee	Risk Committee	Shares (number) [1]	Cash (CHF) (A)	Share (CHF) (B
Board members active on December 31, 2018									
Joerg Reinhardt [4]	Chair				Chair		23 889	1 900 000	1 900 00
Enrico Vanni	Vice Chair	•	Chair	•			4 854	41 667	483 33
Nancy Andrews	•				•	•	2 262	180 000	180 00
Dimitri Azar	•			[5]	•		2 359	182 500	182 50
Ton Buechner	•	[5]				[6]	4 270	–	346 66
Srikant Datar	•	•	•			Chair	2 859	229 167	229 16
Elizabeth Doherty	•	Chair				•	2 828	225 000	225 00
Ann Fudge	•		•	•		•	2 481	199 167	199 16
Frans van Houten	•				[5]		2 334	148 333	168 33
Andreas von Planta	•	•		Chair		•	2 859	229 167	229 16
Charles L. Sawyers	•			•	•		2 262	180 000	180 00
William T. Winters	•		•				4 087	–	321 66
Subtotal							57 344	3 515 001	4 645 00
Board members who stepped down at the 2018 AGM									
Pierre Landolt (until March 2, 2018) [7]	•			[6]			2 131	–	55 00
Subtotal							2 131	–	55 00
Total							59 475	3 515 001	4 700 00

See page 168 for 2017 comparative figures.

[1] The shown amounts represent the gross number of shares delivered to each Board member in 2018 for the respective Board period. The number of shares reported in this column represent: (i) the second and final equity installment delivered in Februar from the 2017 AGM to the 2018 AGM, and (ii) the first of two equity installments delivered in August 2018 for the services fr the 2019 AGM. The second and final equity installment for the services from the 2018 AGM to the 2019 AGM will take place

[2] Includes an amount of CHF 19 958 for mandatory employer contributions for all Board members paid by Novartis to govern systems. This amount is out of total employer contributions of CHF 383 864, and provides a right to the maximum future insur benefit for the Board member.

[3] All amounts are before deduction of the social security contribution and income tax due by the Board member.

[4] No additional committee fees for chairing the Research & Development Committee were delivered to Joerg Reinhardt.
[5] From March 2, 2018
[6] Until March 2, 2018
[7] According to Pierre Landolt, the Sandoz Family Foundation is the economic beneficiary of the compensation.

Board member total compensation earned for the financial year 2017

	Board membership	Audit and Compliance Committee	Compensation Committee	Governance, Nomination and Corporate Responsibilities Committee	Research & Development Committee	Risk Committee	Shares (number) [1]	Cash (CHF) (A)	Share (CHF) (B
Board members active on December 31, 2017									
Joerg Reinhardt [4]	Chair				Chair		24 407	1 900 000	1 900 00
Enrico Vanni	Vice Chair	•	Chair	•			3 210	250 000	250 00
Nancy Andrews	•				•	•	2 311	180 000	180 00
Dimitri Azar	•	•			•		2 504	195 000	195 00
Ton Buechner	•					• [5]	4 039	–	325 00
Srikant Datar	•	• [7]	•			Chair [5]	2 989	227 500	227 50
Elizabeth Doherty	•	Chair [5]				• [5]	2 591	217 500	217 50
Ann Fudge	•		•	•		•	2 504	195 000	195 00
Pierre Landolt [6]	•			•			4 238	–	330 00
Frans van Houten (from February 28, 2017)	•						1 305	75 000	175 00
Andreas von Planta	•	•		Chair		• [8]	2 989	227 500	227 50
Charles L. Sawyers	•			•	•		2 311	180 000	180 00
William T. Winters	•		•				4 238	–	330 00
Total							59 636	3 647 500	4 732 50

[1] The shown amounts represent the gross number of shares delivered to each Board member in 2017 for the respective Board period. The number of shares reported in this column represent: (i) the second and final equity installment delivered in Februar from the 2016 AGM to the 2017 AGM, and (ii) the first of two equity installments delivered in August 2017 for the services fr the 2018 AGM. The second and final equity installment for the services from the 2017 AGM to the 2018 AGM will take place

[2] Includes an amount of CHF 15 622 for mandatory employer contributions for all Board members paid by Novartis to Swiss security systems. This amount is out of total employer contributions of CHF 298 206, and provides a right to the maximum futu government pension benefit for the Board member.

[3] All amounts are before deduction of the social security contribution and income tax due by the Board member.

[4] No additional committee fees for chairing the Research & Development Committee were delivered to Mr. Reinhardt.

[5] From February 28, 2017

[6] According to Pierre Landolt, the Sandoz Family Foundation is the economic beneficiary of the compensation.

[7] Until February 27, 2017, Chair of the Audit and Compliance Committee

[8] Until February 27, 2017, Chair of the Risk Committee

Additional disclosures

Share ownership requirements for Board members

The Chairman is required to own a minimum of 30 000 Novartis shares, and other members of the Board of Directors are required to own at least 5 000 Novartis shares within five years after joining the Board of Directors, to ensure their interests are aligned with those of shareholders.

Board members are prohibited from hedging or pledging their ownership positions in Novartis shares that are part of their guideline share ownership requirement, and are required to hold these shares for 12 months after retiring from the Board of Directors. As of December 31, 2018, all current and former members of the Board of Directors who were required to meet the minimum share ownership requirements did so.

Shares, ADRs and share options owned by Board members

The total number of vested Novartis shares and ADRs owned by members of the Board of Directors and “persons closely linked” to them as of December 31, 2018, is shown in the table below. As of December 31, 2018, no members of the Board, either individually or together with “persons closely linked” to them, owned 1% or more of the outstanding shares (or ADRs) of Novartis. As of the same date, no members of the Board of Directors held any share options to purchase Novartis shares.

	Number of shares at December 31, 2018 [1,2]
Joerg Reinhardt	542 199
Enrico Vanni	23 500
Nancy Andrews	5 739
Dimitri Azar	14 863
Ton Buechner	8 069
Srikant Datar	39 383
Elizabeth Doherty	4 882
Ann Fudge	14 818
Frans van Houten	2 728
Andreas von Planta	133 493
Charles L. Sawyers	9 460
William T. Winters	15 371
Total [3]	814 505

[1] Includes holdings of "persons closely linked" to Board members (see definition on page 161)

[2] Each share provides entitlement to one vote.

[3] Pierre Landolt stepped down from the Board of Directors on March 2, 2018. On March 2, 2018, Mr. Landolt owned 62 520 shares. According to Mr. Landolt, the Sandoz Family Foundation is the economic beneficiary of the shares.

Loans to Board members

Our policy does not allow loans to be granted to current or former members of the Board of Directors or to “persons closely linked” to them. Therefore, no loans were granted in 2018, and none were outstanding as of December 31, 2018.

Other payments to Board members

During 2018, no payments (or waivers of claims) other than those set out in the Board member compensation table (including its footnotes) on page 167 were made to current members of the Board or to “persons closely linked” to them.

Payments to former Board members

During 2018, no payments (or waivers of claims) were made to former Board members or to “persons closely linked” to them, except for the payments reported in Note 26 to the Group’s audited consolidated financial statements.

Compensation governance

Legal framework

The Swiss Code of Obligations and the Corporate Governance Guidelines of the SIX Swiss Exchange require listed companies to disclose certain information about the compensation of Board and Executive Committee members, their equity participation in the Group, and loans made to them. This Annual Report fulfills that requirement. In addition, the Annual Report is in line with the principles of the Swiss Code of Best Practice for Corporate Governance of the Swiss Business Federation (economiesuisse).

Risk management principles

The Compensation Committee, with support from its independent advisor, reviews market trends in compensation, and changes in corporate governance rules and best practices. Together with the Risk Committee, it also reviews the Novartis compensation systems to ensure that they do not encourage inappropriate or excessive risk-taking, and instead encourage behaviors that support sustainable value creation. A summary of the risk management principles is outlined below.

RISK MANAGEMENT PRINCIPLES•Rigorous performance management process, with approval of targets and –evaluation of performance for the CEO by the Board •Balanced mix of short-term and long-term variable compensation elements•Values and Behaviors are a key component of the Annual Incentive and are embedded in our culture•Clawback and malus principles apply to all elements of the variable compensation•Performance-vesting Long-Term Incentives only, with three-year cycles •All variable compensation is capped at 200% of target•Contractual notice period of 12 months•Post-contractual non-–compete limited to a maximum of 12 months from the end of employment (annual base salary and Annual Incentive of the prior year only) as per contract, if applicable•Good and bad leaver provisions apply to variable –compensation of leavers•No severance payments or change-of-control clauses•Share ownership requirements; no hedging or pledging of Novartis share ownership

Executive Committee employment contracts provide for a notice period of up to 12 months and contain no change-of-control clauses or severance provisions (for example, agreements concerning special notice periods, longer-term contracts, “golden parachutes,” waiver of lock-up periods for equities and bonds, shorter vesting periods, and additional contributions to occupational pension schemes). For share ownership requirements, please refer to page 160.

Compensation decision-making authorities

Authority for decisions related to compensation is governed by the Articles of Incorporation, Board Regulations and the Compensation Committee Charter, which are all published on the Company website: www.novartis.com/investors/company-overview/corporate-governance. The Compensation Committee serves as the supervisory and governing body for compensation policies and plans within Novartis, and has overall responsibility for determining, reviewing and proposing compensation policies and plans for approval by the Board in line with the Compensation Committee Charter. A summary of discussions and conclusions of each committee meeting is delivered to the full Board. A summary of the compensation decision-making authorities is set out below.

Compensation authorization levels within the parameters set by the shareholders’ meeting

Decision on	Decision-making authority
Compensation of Chairman and other Board members	Board of Directors
Compensation of CEO	Board of Directors
Compensation of other Executive Committee members	Compensation Committee

Committee member independence

The Compensation Committee is composed exclusively of members of the Board of Directors who meet the independence criteria set forth in the Board Regulations. From the 2018 AGM, the Compensation Committee had the following four members: Ann Fudge, Srikant Datar, Enrico Vanni and William Winters. Mr. Vanni has served as a member since 2011 and as Chair since 2012.

Role of the Compensation Committee’s independent advisor

The Compensation Committee retained Mercer Limited during the financial year 2018 as its independent external compensation advisor. The advisor was hired directly by the Compensation Committee in 2017, and the Compensation Committee has been fully satisfied with the performance and independence of the advisor since its engagement. In determining whether or not to renew the engagement with the advisor, the Compensation Committee evaluates, at least annually, the quality of the consulting service, the independence of the advisor, and the benefits of rotating advisors.

Compensation Committee meetings held in 2018

In 2018, the Compensation Committee held seven formal meetings, one extraordinary meeting, and two additional joint meeting with the Research & Development Committee to review and endorse for approval by the Board of Directors the innovation targets and achievements of the LTPP and Annual Incentive. The Compensation Committee conducted a self-evaluation in 2018.

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6.C Board practices

Corporate governance
Corporate governance overview
Our corporate governance framework
Our leadership structureGovernance bodies General Meeting of ShareholdersApproves operating and financial review, Novartis Group consolidated financial statements and financial statements of Novartis AG; decides appropriation of available earnings and dividend; approves compensation of Board and Executive Committee; elects Board members, Chairman, Compensation Committee members, Independent Proxy and external auditors; adopts and modifies Articles of IncorporationExternal auditorProvides opinion on compliance of Novartis Group consolidated financial statements and the financial statements of NovartisAG with applicable standards and Swiss law, on compliance of the Compensation Report with applicable law, on effectiveness of internal controls over financial reporting, and on the corporate responsibility reporting of NovartisBoard of DirectorsAudit and Compliance CommitteeCompensation CommitteeGovernance, Nomination and Corporate Responsibilities CommitteeResearch & Development CommitteeRisk CommitteeSets strategic direction of Novartis, appoints and oversees key executives, approves major transactions and investmentsExecutive CommitteeResponsible for operational management of Novartis
Our corporate governance framework consists of rules that support sustainable financial performance and long-term value creation for our shareholders and that are aligned with our Values and Behaviors (www.novartis.com/investors/company-overview/corporate-governance). Developments are continuously monitored and result in enhanced principles, processes and disclosures in line with our commitment to maintaining the highest standards.
Laws and regulations
Novartis AG is subject to and compliant with the laws and regulations of Switzerland (in particular, Swiss company and securities laws, SIX Swiss Exchange rules and the Swiss Code of Best Practice for Corporate Governance) and the securities laws of the United States, including New York Stock Exchange (NYSE) rules, as applicable to foreign private issuers of securities. The NYSE listing standards on corporate governance require Novartis AG to describe any material ways in which its corporate governance practices differ from those of domestic listed US companies. These differences are:
• Novartis AG shareholders do not receive written reports directly from Board committees.
• External auditors are appointed by shareholders at the Annual General Meeting of Shareholders (AGM), as opposed to being appointed by the Audit and Compliance Committee.
• While shareholders cannot vote on all equity compensation plans, they are entitled to hold separate, yearly binding votes on Board and Executive Committee compensation.
• The Board has set up a separate Risk Committee that is responsible for business risk oversight, as opposed to delegating this responsibility to the Audit and Compliance Committee.
• The full Board is responsible for overseeing the performance evaluation of the Board and Executive Committee.
• The full Board is responsible for setting objectives relevant to the CEO’s compensation and for evaluating his performance.
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Board and Executive Committee compensation

Information on Board and Executive Committee compensation is outlined in our Compensation Report (see "—Item 6.B Compensation"). Please also refer to articles 29-35 of the Articles of Incorporation (www.novartis.com/investors/company-overview/corporate-governance) stipulating the Board and Executive Committee compensation provisions. According to the general compensation principles as outlined in the Articles of Incorporation, the compensation of the non-executive Board members comprises fixed compensation elements only (no Company contributions to any pension plan, no performance-related elements and no financial instruments). Compensation to Executive Committee members comprises fixed and variable, performance-related compensation. Fixed compensation is comprised of the base salary and may include other elements and benefits such as contributions to pension plans. Variable compensation may comprise short-term and long-term compensation elements. If the maximum aggregate amount of compensation already approved by the AGM is not sufficient to cover the compensation of newly appointed or promoted Executive Committee members, Novartis may pay out compensation, in a total amount up to 40% of the total maximum aggregate amount last approved for the Executive Committee per compensation period, to newly appointed or promoted Executive Committee members.

Our Group structure and shareholders

Our Group structure

Novartis AG and Group companies

Novartis AG, with its registered office at Lichtstrasse 35, CH-4056 Basel, Switzerland, is a corporation organized under Swiss law that has issued registered shares.

As the holding company, Novartis AG owns or controls directly or indirectly all entities worldwide belonging to the Novartis Group and conducting its business operations. The principal Novartis subsidiaries and associated companies are listed in Note 31 to the Group's consolidated financial statements.

Divisions

The Novartis business is divided on a worldwide basis into three operating divisions: Innovative Medicines, with the two business units Novartis Pharmaceuticals and Novartis Oncology; Sandoz (generics); and Alcon (eye care). These businesses are supported by a number of global organizations, including the Novartis Institutes for BioMedical Research (NIBR), which focuses on discovering new drugs; the Global Drug Development organization, which oversees the clinical development of new medicines; and Novartis Operations, which includes Novartis Technical Operations (the global manufacturing organization) and Novartis Business Services (which consolidates support services across Novartis). On June 29, 2018, Novartis announced plans to separate the Alcon business from the rest of Novartis by means of a spin-off subject to an approval by the shareholders at the AGM on February 28, 2019.

Majority holdings in publicly traded Group companies

The Novartis Group owns 70.7% of Novartis India Ltd., with its registered office in Mumbai, India, and listed on the Bombay Stock Exchange (ISIN INE234A01025, symbol: HCBA). The total market value of the 29.3% free float of Novartis India Ltd. was USD 74.7 million at December 31, 2018, using the quoted market share price at year-end. Applying this share price to all the shares of the company, the market capitalization of the whole company was USD 254.8 million, and that of the shares owned by Novartis was USD 180.1 million.

Significant minority shareholding owned by the Novartis Group

The Novartis Group owns 33.3% of the bearer shares of Roche Holding AG, with its registered office in Basel, Switzerland, and listed on the SIX Swiss Exchange (ISIN CH0012032113, symbol: RO). The market value of the Group's interest in Roche Holding AG, as of December 31, 2018, was USD 12.9 billion. The total market value of Roche Holding AG was USD 212.2 billion. Novartis does not exercise control over Roche Holding AG, which is independently governed, managed and operated.

Our shareholders

Significant shareholders

According to the Novartis Share Register, as of December 31, 2018, the following registered shareholders (including nominees and the ADS depositary) held more than 2% of the total share capital of Novartis AG, with the right to vote all their Novartis shares based on an exemption granted by the Board (see "—Item 6.C Board practices—Shareholder participation rights—Voting rights, restrictions and representation"):[1]

- Shareholders: Novartis Foundation for Employee Participation, with its registered office in Basel, holding 2.3%; Emasan AG, with its registered office in Basel, holding 3.5%; and UBS Fund Management (Switzerland) AG, with its registered office in Basel, holding 2.2%
- Nominees: Chase Nominees Ltd., London, holding 9.8%; Nortrust Nominees Ltd., London, holding 3.6%; and The Bank of New York Mellon, New York, holding 4.1% through its nominees, The Bank of New York Mellon, Everett, holding 2.1%, The Bank of New York Mellon, New York, holding 1.3% and the and The Bank of New York Mellon SA/NV, Brussels, holding 0.7%
- ADS depositary: JPMorgan Chase Bank, N.A., New York, holding 13.3%

[1] Excluding 4.6% of the share capital held as treasury shares by Novartis AG or its fully owned subsidiaries

According to a disclosure notification filed with Novartis AG, Norges Bank (Central Bank of Norway), Oslo, held 2.1% of the share capital of Novartis AG but was not registered in the Novartis Share Register as of December 31, 2018.

According to disclosure notifications filed with Novartis AG and the SIX Swiss Exchange, each of the following shareholders held between 3% and 5% but was not registered or registered with less than 2% of the share capital of Novartis AG as of December 31, 2018:

- BlackRock Inc., New York
- The Capital Group Companies Inc., Los Angeles

Disclosure notifications pertaining to shareholdings in Novartis AG that were filed with Novartis AG and the SIX Swiss Exchange are published on the latter's electronic publication platform and can be accessed via: www.six-exchange-regulation.com/en/home/publications/significant-shareholders.html.

Cross shareholdings

Novartis AG has no cross shareholdings in excess of 5% of capital, or voting rights with any other company.

Distribution of Novartis shares

The information in the following tables relates only to registered shareholders and does not include holders of unregistered shares. Also, the information provided in the tables cannot be assumed to represent the entire Novartis AG investor base because nominees and JPMorgan Chase Bank, N.A., as ADS depositary, are registered as shareholders for a large number of beneficial owners.

As of December 31, 2018, Novartis AG had approximately 163 000 registered shareholders.

Number of shares held

As of December 31, 2018	Number of registered shareholders	% of registered share capital
1–100	25 193	0.06
101–1'000	98 629	1.61
1'001–10'000	35 458	3.86
10'001–100'000	3 130	3.18
100'001–1'000'000	458	5.41
1'000'001–5'000'000	62	4.89
5'000'001 or more [1]	30	50.22
Total registered shareholders/shares	162 960	69.23
Unregistered shares		30.77
Total		100.00

[1] Including significant registered shareholders as listed above

Registered shareholders by type

As of December 31, 2018	Shareholders in %	Shares in %
Individual shareholders	96.36	12.87
Legal entities [1]	3.58	32.58
Nominees, fiduciaries and ADS depositary	0.06	54.55
Total	100.00	100.00

[1] Excluding 4.6% of the share capital held as treasury shares by Novartis AG or its fully owned subsidiaries

Registered shareholders by country

As of December 31, 2018	Shareholders in %	Shares in %
Belgium	0.12	1.23
France	2.04	0.29
Germany	5.39	1.83
Japan	0.19	0.73

Luxembourg	0.05	0.53
Switzerland [1]	88.17	42.11
United Kingdom	0.52	24.64
United States	0.36	26.81
Other countries	3.16	1.83
Total	100.00	100.00

Registered shares held by nominees are shown in the country where the company/affiliate entered in the Novartis Share Register as shareholder has its registered seat.

[1] Excluding 4.6% of the share capital held as treasury shares by Novartis AG or its fully owned subsidiaries

Our capital structure

Our share capital

As of December 31, 2018, the share capital of Novartis AG is CHF 1 275 312 410 fully paid-in and divided into 2 550 624 820 registered shares (Novartis share). Each Novartis share has a nominal value of CHF 0.50.

Novartis shares are listed on the SIX Swiss Exchange (ISIN CH0012005267, symbol: NOVN) and on the NYSE in the form of American Depositary Receipts (ADRs) representing Novartis American Depositary Shares (ADSs) (ISIN US66987V1098, symbol: NVS).

Authorized and conditional share capital

No authorized and conditional capital exists as of December 31, 2018.

Changes in capital

Over the past three years, the share capital of Novartis AG changed as follows:

By completing the sixth share repurchase program in 2016, Novartis AG reduced its share capital by CHF 24.9 million (from CHF 1 338 496 500 to CHF 1 313 557 410) by canceling 49 878 180 Novartis shares repurchased on the second trading line during 2015 (at an average price of CHF 93.24 per Novartis share). At the 2016 AGM, shareholders approved the seventh share repurchase program authorizing the Board to repurchase Novartis shares up to a maximum of CHF 10 billion. In 2017, Novartis AG reduced its share capital by CHF 5.1 million (from CHF 1 313 557 410 to CHF 1 308 422 410) by canceling 10 270 000 Novartis shares repurchased on the second trading line during 2016 (at an average price of CHF 74.67 per Novartis share). In 2018, Novartis AG reduced its share capital by CHF 33.11 million (from CHF 1 308 422 410 to CHF 1 275 312 410) by canceling 66 220 000 Novartis shares repurchased on the second trading line during 2017 (at an average price of CHF 78.34 per Novartis share). In 2018, a total of 23.3 million Novartis shares were purchased at an average price of CHF 79.08 per Novartis share. The Board will propose to the shareholders at the 2019 AGM to cancel the Novartis shares repurchased in 2018 and to approve the eighth repurchase program, authorizing the Board to repurchase Novartis shares up to a maximum of CHF 10 billion until the 2022 AGM.

Capital changes

	Number of shares			
Year	As of Jan 1	Changes in shares	As of Dec 31	Changes in CHF
2016	2 676 993 000	– 49 878 180	2 627 114 820	– 24 939 090
2017	2 627 114 820	– 10 270 000	2 616 844 820	– 5 135 000
2018	2 616 844 820	– 66 220 000	2 550 624 820	– 33 110 000

A table with additional information on changes in the Novartis AG share capital can be found in Note 8 to the financial statements of Novartis AG.

Shares, participation certificates, non-voting equity securities, profit-sharing certificates

Novartis shares are issued as uncertificated securities (in the sense of the Swiss Code of Obligations) and as book entry securities (in terms of the Swiss Act on Intermediated Securities). All Novartis shares have equal voting rights and carry equal entitlements to dividends. No participation certificates, non-voting equity securities (Genussscheine) or profit-sharing certificates have been issued.

Transferability and nominee registration

No transferability restrictions are imposed on Novartis shares. The registration of shareholders in the Novartis Share Register or in the ADR register kept by JPMorgan Chase Bank, N.A., does not affect the tradability of Novartis shares or ADRs.

The Articles of Incorporation provide that no nominee shall be registered with the right to vote for more than 0.5% of the registered share capital (for registration of shareholders, see “—Item 6.C Board practices—Shareholder participation rights—Voting rights, restrictions and representation”). The Board may, upon request, grant an exemption from this restriction if the nominee discloses the names, addresses and number of shares of the individuals for whose account it holds 0.5% or more of the registered share capital. Exemptions are in force for the nominees listed in “—Item 6.C Board practices—Our Group structure and shareholders—Our shareholders—Significant shareholders,” and for the nominee

Citibank, London, which in 2015 requested an exemption, but as of December 31, 2018, was not registered in the Novartis Share Register.

The same restrictions indirectly apply to holders of ADRs.

Shareholders, ADR holders, or nominees who are linked to each other or who act in concert to circumvent registration restrictions are treated as one person or nominee for the purposes of the restrictions on registration. The registration restrictions may be changed by resolution of the General Meeting of Shareholders (General Meeting), with approval of at least two-thirds of the votes represented at the meeting (see "—Item 6.C Board practices—Shareholder participation rights—Statutory quorums").

Convertible securities and options

Novartis AG has not issued convertible or exchangeable bonds, warrants, options or other securities granting rights to Novartis shares, other than options (or similar instruments such as stock appreciation rights) granted under or in connection with equity-based participation plans of Novartis associates. Novartis AG does not grant any new stock options under these plans.

Key Novartis share data

	2018	2017	2016
Issued shares	2 550 624 820	2 616 844 820	2 627 114 820
Treasury shares [1]	239 453 391	299 388 321	253 055 807
Outstanding shares at December 31	2 311 171 429	2 317 456 499	2 374 059 013
Weighted average number of shares outstanding	2 319 322 369	2 345 783 843	2 378 474 555

[1] Approximately 122 million treasury shares (2017: 131 million; 2016: 135 million) are held in Novartis entities that restrict their availability for use.

Per-share information1

	2018	2017	2016
Basic earnings per share (USD)	5.44	3.28	2.82
Diluted earnings per share (USD)	5.38	3.25	2.80
Operating cash flow (USD)	6.15	5.38	4.82
Year-end equity for Novartis AG shareholders (USD)	34.01	32.00	32.46
Dividend (CHF) [2]	2.85	2.80	2.75

[1] Calculated on the weighted average number of shares outstanding, except year-end equity

[2] 2018: proposal to shareholders for approval at the Annual General Meeting on February 28, 2019

Key ratios – December 31

	2018	2017	2016
Price/earnings ratio [1]	15.7	25.7	25.7
Enterprise value/EBITDA	14	15	13
Dividend yield (%) [1]	3.4	3.4	3.7

[1] Based on the Novartis share price at December 31 of each year

Key data on ADRs issued in the US

	2018	2017	2016
Year-end ADR price (USD)	85.81	83.96	72.84
High [1]	93.91	86.65	86.21
Low [1]	72.44	70.03	67.59
Number of ADRs outstanding [2]	338 641 387	320 833 039	315 349 314

[1] Based on the daily closing prices

[2] The depositary, JPMorgan Chase Bank, N.A., holds one Novartis AG share for every ADR issued.

Share price (CHF)

	2018	2017	2016
Year-end share price	84.04	82.40	74.10
High [1]	91.84	85.15	86.45
Low [1]	72.42	69.55	68.15
Year-end market capitalization (USD billions) [2]	197.0	195.5	172.0
Year-end market capitalization (CHF billions) [2]	194.2	191.0	175.9

[1] Based on the daily closing prices

[2] Market capitalization is calculated based on the number of shares outstanding (excluding treasury shares). Market capitalization in USD is based on the market capitalization in CHF converted at the year-end CHF/USD exchange rate.

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Our Board of Directors

Composition of the Board of Directors and its committees (as per December 31, 2018)Board of DirectorsChairman: J. ReinhardtVice Chairman: E. VanniN. AndrewsD. AzarT. BuechnerS. DatarE. DohertyA. FudgeF. van HoutenA. von PlantaC. SawyersW. WintersAudit and Compliance CommitteeE. Doherty (Chair)T. BuechnerS. DatarA. von PlantaE. VanniCompensation CommitteeE. Vanni (Chair)S. DatarA. FudgeW. WintersGovernance, Nominat−ion and Corporate Respon−sibilities CommitteeA. von Planta (Chair)D. AzarA. FudgeC. SawyersE. VanniResearch & Development CommitteeJ. Reinhardt (Chair)N. AndrewsD. AzarF. van HoutenC. SawyersRisk CommitteeS. Datar (Chair)N. AndrewsE. DohertyA. FudgeA. von Planta

Election and term of office

At the General Meeting, Board members (including the Chairman) and Compensation Committee members are individually elected or re-elected by shareholders for a term of one year.

There is no mandatory term limit for Board members, enabling the Company to benefit from the insight and knowledge that long-serving Board members have developed about the Company’s operations and practices. However, Board members must retire after reaching age 70. Under special circumstances, shareholders may grant an exemption from this rule and re-elect a Board member for additional terms of office.

Name	Nationality	Year of birth	First election at AGM
Joerg Reinhardt, Ph.D.	D	1956	2013
Enrico Vanni, Ph.D.	CH	1951	2011
Nancy C. Andrews, M.D., Ph.D.	US/CH	1958	2015
Dimitri Azar, M.D.	US	1959	2012
Ton Buechner	NLD/CH	1965	2016
Srikant Datar, Ph.D.	US	1953	2003
Elizabeth Doherty	GB	1957	2016
Ann Fudge	US	1951	2008
Frans van Houten	NLD	1960	2017
Andreas von Planta, Ph.D.	CH	1955	2006
Charles L. Sawyers, M.D.	US	1959	2013
William T. Winters	GB/US	1961	2013

Board profile

Board composition and profile of individual Board members

The composition of the Board aligns with our status as a listed company as well as our business portfolio, geographic reach and culture. To ensure appropriate strategic oversight, we seek Board members who have diverse skills and experience. Collectively, the Board must have background and expertise in one or several of the following areas:

• Leadership, senior management/executive-level experience
• Medicine and healthcare
• Finance and accounting
• Law
• Engineering and technology
• Marketing

Diversity is critical to Board effectiveness and an important criterion for the Governance, Nomination and Corporate Responsibilities Committee (GNCRC) when identifying new Board member candidates.

Board members' biographies (see "—Item 6.C Board practices—Our Board of Directors—Board of Directors") highlight the specific qualifications that led the Board to conclude that members are qualified to serve on the Board and will add value.

Board members should also have the following personal qualities:

• Interact with other Board members to build an effective and complementary Board
• Establish trusting relationships
• Apply independence of thought and judgment
• Be challenging but supportive in the boardroom
• Influence without creating conflict by applying a constructive, non-confrontational style
• Listen well and offer advice based on sound judgment
• Be able and willing to commit adequate time to Board and committee responsibilities
• Be open to personal feedback and seek to be responsive
• Do not have existing board memberships or hold other positions that could lead to a permanent conflict of interest
• Understand and respect the boundaries of the role, leaving the operational management of the Company to the CEO and the Executive Committee

DiversityNationalityAmerican40 %Swiss27 %British13 %German7 %Dutch13 %GenderMale75 %Female25 %Backgrou
management21 %Medicine/healthcare/R&D32 %Finance/accounting21 %Engineering/technology16 %Law5 %Marketing
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Board succession planning

The Chairman, supported by the GNCRC, ensures effective succession plans for the Board, the CEO and the Executive Committee. These plans are discussed by the Board in private meetings without management (the succession plan for the Chairman is discussed in a meeting without him). A search for a new Board member is launched – normally with the support of a professional executive search company – based on the established target profile. Candidates are interviewed by the Chairman and other Board members, and evaluated by the GNCRC. The GNCRC then makes a recommendation to the full Board, and the Board ultimately decides who should be proposed to shareholders for election at the upcoming AGM.

Role of the Board and its committees

The Board is responsible for the overall direction and oversight of management, and holds the ultimate decision-making authority for Novartis AG, with the exception of decisions reserved for shareholders.

The Board has delegated certain of its duties and responsibilities to its five committees led by a Board-elected Chairman, as set out in their written charter (www.novartis.com/sites/www.novartis.com/files/regulations-en.pdf). In some cases, these responsibilities are of an advisory or preparatory nature (A/P). In other cases, the committee has decision-making power that is subject to final Board approval (FBA), or the responsibilities have been fully delegated to the committee (FD). The committees enable the Board to work in an efficient and effective manner, ensuring a thorough review and discussion of issues while giving the Board more time for deliberation and decision-making on other matters. Moreover, committees ensure that only Board members who are independent oversee audit and compliance, governance and compensation – as only independent Board members are members of the respective committees.

Any Board member may request a Board or committee meeting and the inclusion of an agenda item. Before meetings, Board members receive materials to help them prepare the discussions and decision-making.

ResponsibilitiesMembersNumber of meetingsheld in 2018/approximate averageduration (hrs)of each meeting/attendanceDocuments/linkBoard of Directors12/6:15The primary responsibilities of the Board of Directors include:—Setting the strategic direction of the Group—Appointing, overseeing and dismissing key executives, and planning their succession —Approving transactions and investments of fundamental importance to Novartis and all in excess of USD 500 million—Determining the organizational structure and governance of the Group—Determining and overseeing financial planning, accounting, reporting and controlling—Approving annual financial statements and corresponding financial results releasesJoerg Reinhardt[1]Enrico VanniNancy C. AndrewsDimitri AzarTon BuechnerSrikant Datar Elizabeth DohertyAnn FudgeFrans van HoutenAndreas von Planta Charles L. SawyersWilliam T. Winters12121212111012111112111 1Articles of Incorporation of Novartis AG Regulations of the Board of Directors, its Committees and the Executive Committee of Novartis AG (Board regulations)www.novartis.com/investors/company-overview/corporate-governanceAudit and Compliance Committee7/2:45The primary responsibilities of this committee include:—Supervising external auditors (FD),** and selecting and nominating external auditors for election by the meeting of shareholders (FBA)***—Overseeing internal auditors (FD)**—Overseeing accounting policies, financial controls, and compliance with accounting and internal control standards (FD)**—Approving quarterly financial statements and financial results releases (FBA)***—Overseeing internal control and compliance processes and procedures (FD)**—Overseeing compliance with laws, and external and internal regulations (FD)**The Audit and Compliance Committee has the authority to retainexternal consultants and other advisors.Elizabeth Doherty[1,2]Ton Buechner[3]Srikant Datar[2]Andreas von PlantaEnrico Vanni75777Charter of the Audit and Compliance Committee
www.novartis.com/investors/company-overview/corporate-governanceCompensation Committee7/2:00The primary responsibilities of this committee include:—Designing, reviewing and recommending to the Board the compensation policies and programs (FBA)***—Advising the Board on the compensation of Board members and the CEO (A/P)*—Deciding on the compensation of Executive Committee members (FD)**—Preparing the Compensation Report and submitting it to the Boardfor approval (FBA)***The Compensation Committee has the authority to retain external consultants and other advisors.Enrico Vanni[1]Srikant DatarAnn FudgeWilliam T. Winters7777Charter of the Compensation Committeewww.novartis.com/investors/company-overview/corporate-governance1Chairman2Audit Committee Financial Expert3ACC member after 2018 AGM*A/P = advisory or preparatory task**FD = fully delegated task***FBA = task subject to final Board approval

ResponsibilitiesMembersNumber of meetingsheld in 2018/approximate averageduration (hrs)of each meeting/attendanceDocuments/linkGovernance, Nomination andCorporate Responsibilities Committee3/2:00The primary responsibilities of this committee include:—Designing, reviewing and recommending to the Board corporate governance principles (FBA)***—Identifying candidates for election as Board members (FBA)***—Assessing existing Board members and recommending to the Board whether they should stand for re-election (FBA)***—Preparing and reviewing the succession plan for the CEO (FBA)***—Developing and reviewing an onboarding program for new Board members, and an ongoing education plan for existing Board members (FD)**—Reviewing on a regular basis the Articles of Incorporation, with a view to reinforcing shareholder rights (FD)**—Reviewing on a regular basis the composition and size of the Board and its committees (FBA)***—Reviewing annually the independence status of each Board member (FBA)***—Reviewing directorships and agreements of Board members forconflicts of interest, and dealing with conflicts of interest (FD)**—Overseeing the Company's strategy and governance on corporateresponsibility (FBA)***The Governance, Nomination and Corporate Responsibilities Committeehas the authority to retain external consultants and other advisors.Andreas von Planta[1]Dimitri AzarAnn FudgeCharles L. SawyersEnrico Vanni33333Charter of the Governance, Nomination and Corporate Responsibilities Committee www.novartis.com/investors/company-overview/corporate-governanceResearch & Development Committee3/8:00The primary responsibilities of this committee include:—Monitoring research and development, and bringing recommendations to the Board (FBA)***—Assisting the Board with oversight and evaluation related to research and development (FD)**—Informing the Board on a periodic basis about the research and development strategy, the effectiveness and competitiveness of the research and development function, emerging scientific trends and activities critical to the success of research and development,and the pipeline (A/P)*—Advising the Board on scientific, technological, and research and development matters (A/P)*—Providing counsel and know-how to management in the area of research and development (A/P)*—Reviewing such other matters in relation to the Company's research and development as the committee may, in its own discretion, deem desirable in connection with its responsibilities (A/P)*The Research & Development Committee has the authority to retainexternal consultants and other advisors. Joerg Reinhardt[1]Nancy C. AndrewsDimitri AzarFrans van HoutenCharles L. Sawyers33333Charter of the Research & Development Committeewww.novartis.com/investors/company-overview/corporate-governanceRisk Committee4/2:15The primary responsibilities of this committee include:—Ensuring that Novartis has implemented an appropriate and effective risk management system and process (FBA)***—Ensuring that all necessary steps are taken to foster a cultureof risk-adjusted decision-making without constraining reasonable risk-taking and innovation (FBA)***—Approving guidelines and reviewing policies and processes (FBA)***—Reviewing with management, internal auditors and external auditors the identification, prioritization and management of risks; theaccountabilities and roles of the functions involved in riskmanagement; the risk portfolio; and the related actions implemented by management (FBA)***The Risk Committee has the authority to retain external consultantsand other advisors. Srikant Datar[1]Nancy C. AndrewsElizabeth DohertyAnn FudgeAndreas von Planta44444Charter of the Risk Committee www.novartis.com/investors/company-overview/corporate-governance1Chairman*A/P = advisory or preparatory task**FD = fully delegated task***FBA = task subject to final Board approval

Chairman

Joerg Reinhardt has been the independent, non-executive Chairman since August 1, 2013. He has both industry and Novartis experience. As independent Chairman, he leads the Board to represent the interests of all stakeholders. The independent chairmanship also ensures an appropriate balance of power between the Board and the Executive Committee. In this role, Mr. Reinhardt:

• Provides leadership to the Board
• Supports and mentors the CEO
• Ensures that the Board and its committees work effectively
• Sets the agenda, style and tone of Board discussions, promoting constructive dialogue and effective decision-making
• Supported by the GNCRC, ensures that all Board committees are properly established, composed and operated
• Supported by the GNCRC, ensures effective succession plans for the Board and the Executive Committee
• Ensures onboarding programs for new Board members, and continuing education and specialization for all Board members
• Ensures that the Board's performance is annually evaluated
• Promotes effective relationships and communication between Board and Executive Committee members
• Ensures effective communication with the Company's shareholders

Vice Chairman

Enrico Vanni has been the independent, non-executive Vice Chairman since February 22, 2013. In this role, Mr. Vanni:

• Leads the Board in case and as long as the Chairman is incapacitated
• Chairs the sessions of independent Board members, and leads independent Board members if and as long as the Chairman is not independent
• Leads the yearly session of the Board members evaluating the performance of the Chairman, during which the Chairman is not present

No separate meetings of the independent Board members were held in 2018.

Honorary Chairmen

Dr. Alex Krauer and Dr. Daniel Vasella have been appointed Honorary Chairmen in recognition of their significant achievements on behalf of Novartis. They are not provided with Board documents and do not attend Board meetings.

Board meetings

Subject to additional special meetings, the Board and Board committee meetings take place in January, April, June, August, October and December. Typically, these meetings last two days, with the first day allocated to Board committee meetings, and the second day allocated to the meeting of the full Board.

Key activities of our Board and committees in 2018

The following overview summarizes Board and committee activities over the course of the year. Although by no means exhaustive, the lists below provide a flavor of the discussions and debates held, and detail some of the key topics addressed.

Board of Directors:

In 2018, the Board focused on strengthening the operations of Novartis, expanding our therapeutic platforms, and accelerating our push into the data and digital healthcare space to increase our ability to develop breakthrough therapies and improve patient outcomes. The Board also discussed the Alcon spin-off, our investments in breakthrough technologies (including the acquisitions of Endocyte, Inc., AveXis, Inc. and Advanced Accelerator Applications S.A.), as well as the divestments of a part of the US-based generics business of Sandoz and the selling of our remaining consumer healthcare stake to joint venture partner GlaxoSmithKline. Additional topics were the restructuring of our technical operations and business services to become a leaner and more agile organization, our corporate culture as a key driver for the Company, and an evaluation of the impact of external perspectives on our strategy. Topics addressed during private meetings included Board self-evaluation and the performance assessment of the Executive Committee members, as well as CEO and Executive Committee succession planning.

Audit and Compliance Committee:

• Evaluated the impact of adopting new reporting requirements and guidelines
• Focused on acquisitions as well as divestments
• Evaluated the performance of the external auditors

• Discussed the reorganization of Internal Audit

Compensation Committee:

• Decided on compensation related to the changes in Executive Committee membership during the year
• Reviewed the variable compensation programs for Executive Committee members, including financial metrics
• Discussed compensation principles and governance regarding the proposed Alcon spin-off
• Reviewed shareholder feedback from the roadshows
• Discussed potential enhanced disclosures in the 2018 Compensation Report

Governance, Nomination and Corporate Responsibilities Committee:

• Reviewed our corporate responsibility activities
• Reviewed the composition of the Board and its committees
• Evaluated the AGM
• Reflected on the role of companies in society
• Discussed corporate governance developments
• Discussed corporate responsibility reporting changes

Research & Development Committee:
• Discussed the Sandoz biosimilar portfolio
• Discussed Global Drug Development clinical functions
• Reviewed an external assessment of the portfolio and productivity of Novartis research and development
• Discussed technical research and development functions
Risk Committee:
• Assessed main risks and mitigations in Innovative Medicines, NIBR and IT
• Discussed data privacy
• Analyzed pricing
• Evaluated risks and opportunities associated with the digital status and strategy
• Reviewed status and measures regarding cybersecurity
• Reviewed the Enterprise Risk Management Report
Independence of Board members
All Board members are non-executive and independent. The independence of Board members is a key topic in corporate governance. An independent Board member is one who is independent of management and has no business or relationship that could materially interfere with the exercise of objective, unfettered and independent judgment. Only with a majority of Board members being independent can the Board fulfill its obligation to represent the interests of shareholders, being accountable to them and creating sustainable value through the effective governance of Novartis. Accordingly, Novartis established independence criteria based on international best practice standards: www.novartis.com/sites/www.novartis.com/files/independence-criteria-board-of-directors-and-its-committees.pdf
• The majority of Board members and any member of the Audit and Compliance Committee, the Compensation Committee, and the GNCRC must meet the Company's independence criteria. These include, inter alia, (i) a Board member not having received direct compensation of more than USD 120 000 per year from Novartis, except for dividends or Board compensation, within the last three years; (ii) a Board member not having been an employee of Novartis within the last three years; (iii) a family member not having been an executive officer of Novartis within the last three years; (iv) a Board member or family member not being employed by the external auditor of Novartis; (v) a Board member or family member not being a board member, employee or 10% shareholder of an enterprise that has made payments to, or received payments from, Novartis in excess of the greater of USD 1 million or 2% of that enterprise's gross revenues. For the Audit and Compliance Committee and the Compensation Committee members, even stricter rules apply.
• In addition, Board members are bound by the Novartis Conflict of Interest Policy, which prevents a Board member's potential personal interests from influencing the decision-making of the Board.
• The GNCRC annually submits to the Board a proposal concerning the determination of the Board members' independence. For this assessment, the committee considers all relevant facts and circumstances of which it is aware – not only the explicit formal independence criteria. This includes an assessment of whether a Board member is truly independent, in character and judgment, from any member of senior management and from any of his/her current or former colleagues.
Relationship of non-executive Board members with Novartis
No Board member is or was a member of the management of Novartis AG or of any other Novartis Group company in the last three financial years up to December 31, 2018. There are no significant business relationships of any Board member with Novartis AG or with any other Novartis Group company.
Mandates outside the Novartis Group
According to article 34 of the Articles of Incorporation (www.novartis.com/investors/company-overview/corporate-governance), no Board member may hold more than 10 additional mandates in other companies, of which no more than four shall be in other listed companies. Chairmanships of the boards of directors of other listed companies count as two mandates. Each of these mandates is subject to Board approval.
The following mandates are not subject to these limitations:
a) Mandates in companies that are controlled by Novartis AG
b) Mandates that a Board member holds at the request of Novartis AG or companies controlled by it. No Board member shall hold more than five such mandates.

c) Mandates in associations, charitable organizations, foundations, trusts and employee welfare foundations. No Board member may hold more than 10 such mandates.

“Mandates” means those in the supreme governing body of a legal entity that is required to be registered in the commercial register or a comparable foreign register. Mandates in different legal entities that are under joint control are deemed one mandate.

The Board may issue regulations that determine additional restrictions, taking into account the position of the respective member.

Loans and credits

No loans or credits are granted to Board members.

Board performance and effectiveness evaluation

Annually, the Board conducts a review to evaluate its performance, the performance of its committees, and the performance of each Board member. This review covers topics including Board composition, purpose, scope and responsibilities; Board processes and governance; Board meetings and pre-reading material; and team effectiveness, leadership and culture.

As part of this process, each Board member completes a questionnaire, which lays the groundwork for a qualitative review led by the Chairman. The Chairman of the Board and the committees each lead a qualitative review with their colleagues and then with the entire Board. Also, the Board, without its Chairman, discusses the performance of the Chairman. Any suggestion for improvement is recorded, and actions are agreed upon. The results of the 2018 review were discussed at the December 2018 and January 2019 meetings. It was concluded that the Board and its committees operate effectively.

Periodically, this process is conducted by an independent consultant. This last happened in 2017.

Information and control systems of the Board vis-à-vis management

Information on management

The Board ensures that it receives sufficient information from the Executive Committee to perform its supervisory duty and undertake the non-delegable decisions. The Board obtains this information through several means:

• The CEO informs the Board regularly about current developments.
• Executive Committee meeting minutes are made available to the Board.
• Meetings or teleconferences are held as required between Board members and the CEO.
• The Board and Board committees regularly meet with the CEO and other Executive Committee members, and occasionally with other senior management members.
• The Board receives detailed written updates from each division and business unit head via the CEO Report on a monthly basis and via a yearly presentation from each division and business unit head.
• By invitation, other members of management attend Board meetings to report on areas of the business for which they are responsible.
• Board members are entitled to request information from Executive Committee members or any other Novartis associate, and they may visit any Novartis site.

To get an outside view, the Board and Board committees occasionally invite external advisors to attend and/or represent a specific topic at Board meetings. In particular, the independent advisor of the Compensation Committee is regularly invited to partly attend meetings. The Chief Financial Officer (CFO), the Group General Counsel, the Global Head of Novartis Business Assurance & Advisory/Internal Audit, the Head of Group Financial Reporting & Accounting, the Chief Ethics, Risk and Compliance Officer, and representatives of the external auditors are invited to partly attend each Audit and Compliance Committee meeting. Additionally, the Global Head of the SpeakUp Office and the Head of Novartis Group Quality report on a regular basis to the Audit and Compliance Committee.

Novartis management information system

Novartis produces comprehensive, consolidated (unaudited) financial statements on a monthly basis for the Group and its operating divisions. These are typically available within 10 days after the end of the month, and include the following:

• Consolidated income statement of the month and year-to-date in accordance with International Financial Reporting Standards (IFRS), as well as adjustments to arrive at core results, as defined by Novartis (see “Item 5. Operating and Financial Review and Prospects—Item 5.A Operating results—Non-IFRS measures as defined by Novartis”). The IFRS and core figures are compared to the prior-year period and targets in both USD and on a constant currency basis.
• Supplementary data on a monthly and year-to-date basis, such as free cash flow, gross and net debt, headcount, personnel costs, working capital, and earnings per share on a USD basis where applicable

An explanation of non-IFRS measures can be found in “Item 5. Operating and Financial Review and Prospects—Item 5.A Operating results—Non-IFRS measures as defined by Novartis.”

Management information related to the consolidated income statements and free cash flow is made available to Board members on a monthly basis through the CEO Report. An analysis of key deviations from the prior year or target is also provided.

Prior to the release of each quarter’s results, the Board receives the actual consolidated financial statement information and an outlook of the full-year results in accordance with IFRS and “core” results (as defined by Novartis), together with

related commentary.

On an annual basis in the middle of the year, the Board also reviews and approves the Company's strategic plan for the next three years. In the fourth quarter of the year, the Board receives and approves the operating targets for the following year as well as the financial targets for the following three-year period, including a projected consolidated income statement in USD prepared in accordance with IFRS and non-IFRS measures as defined by Novartis ("core results").

The Board does not have direct access to the Company's financial and management reporting systems but can, at any time, request more detailed financial information on any aspect that is presented to it.

Internal Audit

The purpose of the Internal Audit function is to assist the Board and the Executive Committee in discharging their governance responsibilities by providing independent assurance, advice and insights on the effectiveness and efficiency of processes and controls that support Novartis in achieving its objectives, identifying and managing its major risks, and ensuring compliance with applicable policies, laws and regulations.

The execution of the Audit and Compliance Committee-approved audit plan via audit and advisory engagements happens at both the Group and individual entity

levels, depending on the risk exposure. Internal Audit reports the results to the audited units, the Audit and Compliance Committee, and the Executive Committee. Additionally, the Audit and Compliance Committee and the Executive Committee receive consolidated results (including a root cause analysis). Internal Audit also shares best practices as well as recurring findings with the business to foster learning and continuous improvement. Any material irregularities, whether actual or suspected, are directly escalated to the SpeakUp Office for investigation and to the Audit and Compliance Committee. Action plans to implement necessary changes and enhancements are developed together with the business and/or the auditee, and their closure is monitored by Internal Audit. In case of major findings, a follow-up audit is planned to ensure proper remediation. All issues and recommendations are stored in a single application to enable efficient follow-up monitoring.

Internal Audit has performed 82 audits from its annual plan, and has conducted 31 advisory engagements and site visits. Overall progress has mainly been identified in the area of compliance. Remediation plans to address information security, data privacy and business continuity risks are on track. Recurring observations identified across various functions and business units relate to improving third-party management, cross-functional collaboration, legacy systems and complex processes.

Risk management

In 2018, we combined our risk management and compliance functions into a single organizational umbrella to provide the businesses with a better view of the risks we face as an organization, and how those risks could impact our ability to deliver on strategic priorities. Our approach to risk management includes streamlining the risk assessment and monitoring process to ensure that we have a single risk approach throughout Novartis, fully supported by online tools and data analytics. In 2018, we launched our newly harmonized Integrity & Compliance Risk Assessment and Monitoring (RAM) process. The RAM process integrates current risk assessments, self-assessments, control activities and monitoring into a single, continuous, cyclical process.

Organizational and process measures have been designed to identify and mitigate risks at an early stage. Organizationally, the responsibility for risk assessment and management is allocated to the divisions, organizational units and functions, with specialized corporate functions – such as Group Finance; Group Legal; Group Quality Assurance; Corporate Health, Safety and Environment; Business Continuity Management; Integrity and Compliance; and the SpeakUp Office – providing support and controlling the effectiveness of the risk management in these respective areas.

The Risk Committee assists the Board of Directors in ensuring that risks are properly assessed and professionally managed by overseeing the risk management system and processes, as well as by reviewing the risk portfolio and related actions implemented by management. For this purpose, the Group Risk Office and the risk owners of the divisions report on a regular basis to the Risk Committee. The Risk Committee ensures that all necessary steps are taken to foster a culture of risk-adjusted decision-making without constraining reasonable risk-taking and innovation. The Risk Committee also assumes responsibility for approving guidelines and reviewing guidelines and processes, and informs the Board on a periodic basis about the risk management system as well as the most significant risks and how they are managed. Together with management, internal auditors and external auditors, the Risk Committee reviews the identification, prioritization and management of the risks; the accountabilities and roles of the functions involved with risk management; the risk portfolio; and the related actions implemented by management. The Group General Counsel, the Head of the Group Risk Office, the Global Head of Novartis Business Assurance & Advisory/Internal Audit, the Chief Ethics, Risk and Compliance Officer, and other senior executives are invited to the meetings of the Risk Committee. The Compensation Committee works closely with the Risk Committee to ensure that the compensation system does not lead to excessive risk-taking by management (for details, see “—Item 6.B Compensation”).

Board of Directors

Joerg Reinhardt, Ph.D.
Chairman of the Board of Directors | Nationality: German | Year of Birth: 1956
Joerg Reinhardt, Ph.D., has been Chairman of the Board of Directors since 2013. He is also Chairman of the Research & Development Committee and Chairman of the Board of Trustees of the Novartis Foundation.
Mr. Reinhardt is chairman of the board of trustees of the Institute of Molecular and Clinical Ophthalmology Basel (IOB), Switzerland. From 2010 to mid-2013, he was chairman of the board of management and the executive committee of Bayer HealthCare, Germany. Prior to that, he was Chief Operating Officer of Novartis from 2008 to 2010, and Head of the Vaccines and Diagnostics Division of Novartis from 2006 to 2008. Mr. Reinhardt is a non-executive board member of Swiss Re, Switzerland, and a member of the European Advisory Panel of Temasek, Singapore. Additionally, he was a member of the board of directors of Lonza Group AG in Switzerland from 2012 to 2013, Chairman of the Board of the Genomics Institute of the Novartis Research Foundation in the United States from 2000 to 2010, and a member of the supervisory board of MorphoSys AG in Germany from 2001 to 2004.
Mr. Reinhardt graduated with a doctorate in pharmaceutical sciences from Saarland University in Germany. He joined Sandoz Pharma Ltd. in 1982 and held various positions at Sandoz and later Novartis, including Head of Development.
Enrico Vanni, Ph.D.
Vice Chairman of the Board of Directors | Nationality: Swiss | Year of Birth: 1951
Enrico Vanni, Ph.D., has been a member of the Board of Directors since 2011 and qualifies as an independent Non-Executive Director. He is Vice Chairman of the Board of Directors and Chairman of the Compensation Committee. He is also a member of the Audit and Compliance Committee and the Governance, Nomination and Corporate Responsibilities Committee.
Mr. Vanni retired as director of McKinsey & Company in 2007. He is a board member of several companies in industries from healthcare to private banking, including Advanced Oncotherapy PLC in the United Kingdom, and non-listed companies such as Lombard Odier SA and Banque Privée BCP (Suisse) SA – both based in Switzerland. He previously served on the boards of Eclosion2 in Switzerland from 2009 to 2017, Alcon Inc. in Switzerland from 2010 to 2011, and Actavis PLC in Ireland in 2010.
Mr. Vanni holds an engineering degree in chemistry from the Federal Polytechnic School of Lausanne, Switzerland; a doctorate in chemistry from the University of Lausanne; and a Master of Business Administration from INSEAD in Fontainebleau, France. He began his career as a research engineer at the International Business Machines Corp. (IBM) in California, United States, and joined McKinsey in Zurich in 1980. He managed the Geneva office for McKinsey from 1988 to 2004, and consulted for companies in the pharmaceutical, consumer and finance sectors. He led McKinsey's European pharmaceutical practice and served as a member of the firm's partner review committee prior to his retirement. From 2008 to 2015, he was an independent consultant, supporting leaders of pharmaceutical and biotechnology companies on core strategic challenges facing the healthcare industry.
Nancy C. Andrews, M.D., Ph.D.
Member of the Board of Directors | Nationality: American/Swiss | Year of Birth: 1958
Nancy C. Andrews, M.D., Ph.D., has been a member of the Board of Directors since 2015. She qualifies as an independent Non-Executive Director and is a member of the Research & Development Committee and the Risk Committee.
Dr. Andrews is dean emerita of the Duke University School of Medicine and vice chancellor emerita for academic affairs at Duke University in the United States. She served as dean and vice chancellor from 2007 to 2017. She is a professor of pediatrics, pharmacology and cancer biology at Duke, and was elected as a fellow of the American Association for the Advancement of Science and to membership in the US National Academy of Sciences, the National Academy of Medicine, and the American Academy of Arts and Sciences. She is chair of the board of directors of the American Academy of Arts and Sciences, a member and former chair of the board of directors of the Burroughs Wellcome Fund, a member of the Massachusetts Institute of Technology (MIT) Corporation, and former president of the American Society for Clinical Investigation. Additionally, she serves on the council of the National Academy of Medicine, on the Scientific Management Review Board of the National Institutes of Health and on the Scientific Advisory Board of Dyne Therapeutics, all in the US.

Dr. Andrews holds a doctorate in biology from MIT and a doctor of medicine from Harvard Medical School, both in the US. She completed her residency and fellowship trainings in pediatrics and hematology/oncology at Boston Children's Hospital and the Dana-Farber Cancer Institute, also in the US, and served as an attending physician at Boston Children's Hospital. Prior to joining Duke, Dr. Andrews was director of the Harvard/MIT M.D.-Ph.D. Program, and dean of basic sciences and graduate studies as well as professor of pediatrics at Harvard Medical School. From 1993 to 2006, she was a biomedical research investigator of the Howard Hughes Medical Institute in the US. Her research expertise is in iron homeostasis and mouse models of human diseases.

Dimitri Azar, M.D.

Member of the Board of Directors | Nationality: American | Year of Birth: 1959

Dimitri Azar, M.D., has been a member of the Board of Directors since 2012. He qualifies as an independent Non-Executive Director and is a member of the Governance, Nomination and Corporate Responsibilities Committee and the Research & Development Committee.

Dr. Azar is senior director of ophthalmological innovation at Alphabet Verily Life Sciences. He also serves as distinguished professor of ophthalmology, bioengineering and pharmacology at the University of Illinois at Chicago (UIC) College of Medicine in the United States, and was dean of the UIC College of Medicine from 2011 to 2018. From 2006 to 2011, he was head of the Department of Ophthalmology and Visual Sciences at UIC. He is a member of the American Ophthalmological Society, a board member of the Chicago Medical Society, and former president of the Chicago Ophthalmological Society. Additionally, he is on the board of the Tear Film and Ocular Surface Society, the board of Verb Surgical Inc., and the scientific board of Verily – all based in the US.

Dr. Azar began his career at the American University of Beirut Medical Center in Lebanon, and completed his fellowship and residency training at the Massachusetts Eye and Ear Infirmary at Harvard Medical School in the US. His research on matrix metalloproteinases in corneal wound healing and angiogenesis has been funded by the US National Institutes of Health since 1993. Dr. Azar practiced at the Wilmer Eye Institute at the Johns Hopkins Hospital School of Medicine in the US, and then returned to the Massachusetts Eye and Ear Infirmary as director of cornea and external disease. He became professor of ophthalmology with tenure at Harvard Medical School in 2003. Dr. Azar holds a master's degree from Harvard and an Executive Master of Business Administration from the University of Chicago Booth School of Business in the US.

Ton Buechner

Member of the Board of Directors | Nationality: Dutch/Swiss | Year of Birth: 1965

Ton Buechner has been a member of the Board of Directors since 2016. He qualifies as an independent Non-Executive Director and is a member of the Audit and Compliance Committee.

Mr. Buechner most recently served as chairman and CEO of the executive board of Dutch multinational AkzoNobel from 2012 to 2017. Prior to joining AkzoNobel, he spent almost two decades at the Sulzer Corporation in Switzerland, where he was appointed divisional president in 2001 and served as president and CEO from 2007 to 2011. Mr. Buechner's early career was spent in the oil and gas construction industry, and included roles at Allseas Engineering in the Netherlands and at Aker Kvaerner in Singapore. He served as a member of the supervisory board of Voith GmbH & Co. KGaA in Germany from 2014 to 2018, and continues to serve on Voith's presidential and shareholder committees.

Mr. Buechner is an engineer by training. He received his master's degree in civil engineering from Delft University of Technology in the Netherlands in 1988, specializing in offshore construction technology and coastal engineering. Mr. Buechner holds a Master of Business Administration from IMD business school in Lausanne, Switzerland.

Srikant Datar, Ph.D.

Member of the Board of Directors | Nationality: American | Year of Birth: 1953

Srikant Datar, Ph.D., has been a member of the Board of Directors since 2003 and qualifies as an independent Non-Executive Director. He is Chairman of the Risk Committee, as well as a member of the Audit and Compliance Committee and the Compensation Committee. The Board of Directors has appointed him as Audit Committee Financial Expert.

Since 1996, Mr. Datar has been the Arthur Lowes Dickinson professor of business administration at Harvard Business School in the United States. Additionally, since 2015, he has been faculty chair of the Harvard Innovation Lab and senior associate dean for university affairs at Harvard Business School. He is a member of the boards of directors of ICF International Inc., Stryker Corp. and T-Mobile US, all in the US. He previously served on the boards of HCL Technologies Ltd. (2012 to 2014) and KPIT Cummins Infosystems Ltd. (2007 to 2012), both based in India.

Mr. Datar graduated in 1973 with distinction in mathematics and economics from the University of Bombay in India. He is a chartered accountant, and holds two master's degrees and a doctorate from Stanford University in the US. Mr. Datar has worked as an accountant and planner in industry, and as a professor at Carnegie Mellon University, Stanford University and Harvard University, all in the US. His research interests are in the areas of cost management, measurement of productivity, new product development, innovation, time-based competition, incentives and performance evaluation. He is the author of many scientific publications and has received several academic awards

and honors. Mr. Datar has also advised and worked with numerous companies in research, development and training.
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Elizabeth (Liz) Doherty

Member of the Board of Directors | Nationality: British | Year of Birth: 1957

Elizabeth (Liz) Doherty has been a member of the Board of Directors since 2016. She qualifies as an independent Non-Executive Director and is Chairman of the Audit and Compliance Committee and a member of the Risk Committee. The Board of Directors has appointed her as Audit Committee Financial Expert.

Ms. Doherty is a senior independent director and chairman of the audit and risk committee of Dunelm Group PLC in the United Kingdom, and a member of the supervisory board and audit committee of Corbion NV in the Netherlands. She is a fellow of the Chartered Institute of Management Accountants; a non-executive board member of the UK Ministry of Justice; a non-executive board member of Her Majesty's Courts and Tribunals Service in the UK; and an advisor to GBfoods and Affinity Petcare SA, subsidiaries of Agrolimen SA. She previously served as a non-executive director and audit committee member at Delhaize Group in Belgium and Nokia Corp. in Finland, and as a non-executive director at SABMiller PLC in the UK.

Ms. Doherty received her bachelor's degree in liberal studies in science (physics) from the University of Manchester in the UK. She began her career as an auditor and has held senior finance and accounting roles at Unilever PLC and Tesco PLC. Her previous positions also include interim chief financial officer (CFO) of Cognita Schools Ltd. from 2014 to 2015, CFO and board member of Reckitt Benckiser Group PLC from 2011 to 2013, interim CFO of City Inn in 2010, and CFO of Brambles Ltd. from 2007 to 2009.

Ann Fudge

Member of the Board of Directors | Nationality: American | Year of Birth: 1951

Ann Fudge has been a member of the Board of Directors since 2008. She qualifies as an independent Non-Executive Director and is a member of the Compensation Committee; the Governance, Nomination and Corporate Responsibilities Committee; and the Risk Committee.

Ms. Fudge is chair of the United States Program Advisory Panel of the Bill & Melinda Gates Foundation, and vice chairman of Boston-based WGBH Public Media. She is also a non-executive director of Northrop Grumman Corporation in the US, and a member of the visiting committee of Harvard Business School in the US. She served as a non-executive director of Unilever, London and Rotterdam, from 2009 to 2018, and as vice chairman and senior independent director of Unilever from 2015 to 2018. Additionally, she was a board member of General Electric Co. in the US from 1999 to 2015.

Ms. Fudge received her bachelor's degree from Simmons College in the US and her Master of Business Administration from Harvard Business School. She is former chairman and CEO of Young & Rubicam Brands, New York. Before that, she served as president of the Beverages, Desserts and Post Division of Kraft Foods Inc.

Frans van Houten

Member of the Board of Directors | Nationality: Dutch | Year of Birth: 1960

Frans van Houten has been a member of the Board of Directors since February 2017. He qualifies as an independent Non-Executive Director and is a member of the Research & Development Committee.

Mr. van Houten is CEO and chairman of the executive committee and the board of management of Royal Philips, a position he has held since 2011. Under his leadership, Philips has transformed itself into a focused health technology company. From May 2016 through December 2017, he also served as vice chairman and a member of the supervisory board of Philips Lighting.

Mr. van Houten holds a master's degree in economics and business management from Erasmus University Rotterdam in the Netherlands. He joined Philips in 1986 and has held multiple global senior leadership positions. In 2009 and 2010, he was a consultant to the boards of companies such as ING Group NV and ASM International NV. Before that, he was CEO of NXP Semiconductors (a Philips spin-off) from 2004 to 2009.

Andreas von Planta, Ph.D.
Member of the Board of Directors | Nationality: Swiss | Year of Birth: 1955
Andreas von Planta, Ph.D., has been a member of the Board of Directors since 2006. He qualifies as an independent Non-Executive Director and is Chairman of the Governance, Nomination and Corporate Responsibilities Committee. He is also a member of the Audit and Compliance Committee and the Risk Committee.
Mr. von Planta provides senior counsel to the law firm Lenz & Staehelin AG, where he was a partner from 1988 through 2017. He is chairman of HSBC Private Bank (Suisse) SA, chairman of the regulatory board of the SIX Swiss Exchange AG, and a board member of Helvetia Holding AG in Switzerland. He also serves on the boards of various Swiss subsidiaries of foreign companies and other non-listed Swiss companies, including Burberry (Suisse) SA, A.P. Moller Finance SA and Socotab Frana SA. He previously served on the boards of Raymond Weil SA (2007 to 2018) and Lenz & Staehelin (1996 to 2018), both based in Switzerland.
Mr. von Planta holds a doctorate in law from the University of Basel in Switzerland, and a Master of Laws from Columbia Law School in the United States. He passed his bar examinations in Basel in 1982, and specializes in corporate law, corporate governance, corporate finance, company reorganizations, and mergers and acquisitions. He served as chairman of Clinique Générale-Beaulieu SA from 2011 to 2016, and as a director there from 2008 to 2016. Additionally, he was chairman of Swiss National Insurance Company Ltd. (Nationale Suisse) from 2011 to 2015, a director at Nationale Suisse from 1997 to 2015, and a director at Holcim Ltd. from 2003 to 2014.
Charles L. Sawyers, M.D.
Member of the Board of Directors | Nationality: American | Year of Birth: 1959
Charles L. Sawyers, M.D., has been a member of the Board of Directors since 2013. He qualifies as an independent Non-Executive Director and is a member of the Governance, Nomination and Corporate Responsibilities Committee and the Research & Development Committee.
In the United States, Dr. Sawyers is chair of the Human Oncology and Pathogenesis Program at Memorial Sloan Kettering Cancer Center, professor of medicine and of cell and developmental biology at the Weill Cornell Graduate School of Medical Sciences, and an investigator at the Howard Hughes Medical Institute. He was appointed to the US National Cancer Advisory Board, and is former president of the American Association for Cancer Research and of the American Society for Clinical Investigation. He is also a member of the US National Academy of Sciences, the National Academy of Medicine, and the American Academy of Arts and Sciences. He serves as a science advisor for the following companies: Agios Pharmaceuticals Inc., Housey Pharmaceutical Research Laboratories, Nextech Invest Ltd., Blueprint Medicines Corporation, BeiGene Ltd., The Column Group, ORIC Pharmaceuticals Inc., KSQ Therapeutics Inc., Foghorn Therapeutics Inc. and PMV Pharmaceuticals Inc.
Dr. Sawyers received his doctor of medicine from the Johns Hopkins University School of Medicine in the US, and worked at the Jonsson Comprehensive Cancer Center at the University of California, Los Angeles, for nearly 18 years before joining Memorial Sloan Kettering in 2006. An internationally acclaimed cancer researcher, he co-developed the Novartis cancer drug *Gleevec/Glivec* and has received numerous honors and awards, including the Lasker-DeBakey Clinical Medical Research Award in 2009.
William T. Winters
Member of the Board of Directors | Nationality: British/American | Year of Birth: 1961
William T. Winters has been a member of the Board of Directors since 2013. He qualifies as an independent Non-Executive Director and is a member of the Compensation Committee.
Mr. Winters is CEO and a board member of Standard Chartered, based in London. He also serves on the board of Colgate University in the United States, and on the boards of the International Rescue Committee and the Print Room theater in the United Kingdom.
Mr. Winters received his bachelor’s degree from Colgate University and his Master of Business Administration from the Wharton School of the University of Pennsylvania in the US. From 2011 to 2015, he was chairman and CEO of Renshaw Bay, an alternative asset management firm. Prior to that, he was co-CEO of JPMorgan’s investment bank from 2003 to 2010. He joined JPMorgan in 1983 and has held management roles across several market areas and in corporate finance. Additionally, he was a commissioner on the UK Independent Commission on Banking in 2010 and 2011, and was awarded the title of Commander of the Order of the British Empire in 2013.
Honorary Chairmen
Alex Krauer, Ph.D.

Daniel Vasella, M.D.
Corporate Secretary
Charlotte Pamer-Wieser, Ph.D.
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Our management

Composition of the Executive Committee (as per December 31, 2018)Vasant NarasimhanChief Executive OfficerSteven BaertChief People & Organization OfficerElizabeth BarrettCEO, Novartis Oncology(until December 31, 2018)1Bertrand BodsonChief Digital OffierJames BradnerPresident of the Novartis Institutesfor BioMedical Research (NIBR)Richard FrancisCEO, SandozPaul HudsonCEO, Novartis PharmaceuticalsHarry KirschChief Financial OfficerShannon Thyme KlingerGroup General CounselSteffen LangGlobal Head of NovartisTechnical OperationsKlaus MoosmayerChief Ethics, Risk and Compliance OfficerJohn TsaiHead of Global Drug Developmentand Chief Medical OfficerRobert WeltevredenHead of Novartis Business Services1Susanne Schaffert was appointed CEO Novartis Oncology and a member of the Executive Committee, effective January 1, 2019.

Executive Committee composition

The Executive Committee is led by the CEO. Its members are appointed by the Board. There are no contracts between Novartis and third parties whereby Novartis would delegate any business management tasks to such third parties.

Executive Committee role and functioning

The Board has delegated to the Executive Committee overall responsibility for and oversight of the operational management of Novartis. This includes:

• Recruiting, appointing and promoting senior management
• Ensuring the efficient operation of the Group and the achievement of optimal results
• Promoting an active internal and external communications policy
• Developing policies and strategic plans for Board approval, and implementing those approved
• Submitting the following to the Board for approval: investments, divestments, transactions, contracts and litigations with a value exceeding USD 500 million, important capital market and other financing transactions, as well as all (other) matters of fundamental significance for the Novartis Group
• Preparing and submitting quarterly and annual reports to the Board and its committees
• Informing the Board of all matters of fundamental significance to the businesses
• Dealing with any other matters delegated by the Board

CEO

In addition to other Board-assigned duties, the CEO leads the Executive Committee, building and maintaining an effective executive team. With the support of the Executive Committee, the CEO:

• Is responsible for the operational management of Novartis
• Develops strategy proposals to be recommended to the Board, and ensures that approved strategies are implemented
• Plans human resourcing to ensure that Novartis has the capabilities and means to achieve its plans, and that robust management succession and management development plans are in place and presented to the Board
• Develops an organizational structure, and establishes processes and systems to ensure the efficient organization of resources
• Ensures that financial results, business strategies and, when appropriate, targets and milestones are communicated to the investment community – and generally develops and promotes effective communication with shareholders and other stakeholders
• Ensures that the business performance is consistent with business principles as well as high legal and ethical standards, and that the culture of Novartis is consistent with the Novartis Values and Behaviors
• Develops processes and structures to ensure that capital investment proposals are reviewed thoroughly, that associated risks are identified, and that appropriate steps are taken to manage these risks
• Develops and maintains an effective framework of internal controls over risk in relation to all business activities of the Company
• Ensures that the flow of information to the Board is accurate, timely and clear

Mandates outside the Novartis Group

According to article 34 of the Articles of Incorporation (www.novartis.com/investors/company-overview/corporate-governance), no Executive Committee member may hold more than six additional mandates in other companies, of which no more than two additional mandates shall be in other listed companies. Each of these mandates is subject to Board approval. Executive Committee members are not allowed to hold chairmanships of the boards of directors of other listed companies.

The following mandates are not subject to these limitations:

a) Mandates in companies that are controlled by Novartis AG

b) Mandates that an Executive Committee member holds at the request of Novartis AG or companies controlled by it. No Executive Committee member shall hold more than five such mandates.

c) Mandates in associations, charitable organizations, foundations, trusts and employee welfare foundations. No Executive Committee member may hold more than 10 such mandates.

“Mandates” means those in the supreme governing body of a legal entity that is required to be registered in the commercial register or a comparable foreign register. Mandates in different legal entities that are under joint control are deemed one mandate.

The Board may issue regulations that determine additional restrictions, taking into account the position of the respective member.

Loans and credits

No loans or credits shall be granted to Executive Committee members.

Executive Committee

Vasant (Vas) Narasimhan, M.D.
Chief Executive Officer of Novartis | Nationality: American | Year of Birth: 1976
Vasant (Vas) Narasimhan, M.D., has been Chief Executive Officer (CEO) of Novartis since February 1, 2018.
Dr. Narasimhan previously was Global Head of Drug Development and Chief Medical Officer for Novartis. He has also served as Global Head of Development for Novartis Pharmaceuticals, Global Head of the Sandoz Biopharmaceuticals and Oncology Injectables business unit, Global Head of Development for Novartis Vaccines, North America Region Head for Novartis Vaccines, and United States Country President for Novartis Vaccines and Diagnostics. Before joining Novartis in 2005, he worked at McKinsey & Company.
Dr. Narasimhan received his medical degree from Harvard Medical School in the US, a master's degree in public policy from Harvard's John F. Kennedy School of Government, and a bachelor's degree in biological sciences from the University of Chicago in the US. During and after his medical studies, he worked extensively on a range of public health issues in developing countries. He is an elected member of the US National Academy of Medicine and serves on the board of fellows of Harvard Medical School.
Steven Baert
Chief People & Organization Officer of Novartis | Nationality: Belgian | Year of Birth: 1974
Steven Baert has been Chief People & Organization Officer of Novartis since 2014. He is a member of the Executive Committee of Novartis.
Mr. Baert joined Novartis in 2006 as Head of Human Resources Global Functions in Switzerland. He has held other leadership roles at Novartis, including Head of Human Resources for Emerging Growth Markets; Head of Human Resources, United States and Canada, for Novartis Pharmaceuticals Corporation; and Global Head of Human Resources for Novartis Oncology. Prior to joining Novartis, he held HR positions at Bristol-Myers Squibb Co. and Unilever.
Mr. Baert studied in Belgium and received a Master of Business Administration from Vlerick Business School in Ghent, a Master of Laws from the Katholieke Universiteit Leuven, and a Bachelor of Laws from the Katholieke Universiteit Brussels. He serves on the board of WeSeeHope USA, and from 2015 to 2018, he represented Novartis on the board of GlaxoSmithKline Consumer Healthcare Holdings Ltd.
Elizabeth (Liz) Barrett (until December 31, 2018)
CEO, Novartis Oncology | Nationality: American | Year of Birth: 1962
Elizabeth (Liz) Barrett was appointed CEO of Novartis Oncology on February 1, 2018. On December 31, 2018, she stepped down as CEO of Novartis Oncology and as a member of the Executive Committee of Novartis.
Ms. Barrett previously served as global president of oncology at Pfizer Inc. Since joining Pfizer in 2009, she has held other leadership positions, including president of Global Innovative Pharma for Europe, president of the specialty care business unit for North America, and president of United States oncology. Prior to Pfizer, she was vice president and general manager of the oncology business unit at Cephalon Inc. from 2006 to 2009, and before that, she worked at Johnson & Johnson. She started her career at Kraft Foods Group Inc. in 1984.
Ms. Barrett holds a Bachelor of Science from the University of Louisiana and a Master of Business Administration from Saint Joseph's University, both in the US.
Bertrand Bodson
Chief Digital Officer of Novartis | Nationality: Belgian | Year of Birth: 1975
Bertrand Bodson has been Chief Digital Officer of Novartis since January 1, 2018. He is a member of the Executive Committee of Novartis.
From 2013 to 2017, Mr. Bodson served as chief digital and marketing officer of Sainsbury's Argos, where he led Argos' successful transformation from a traditional catalogue business to the third-largest online retailer in the United Kingdom. Prior to that, he was executive vice president of the global digital business at EMI Music from 2010 to 2013. He co-founded Bragster.com, a social networking and content sharing website, and has also held senior roles at Amazon.
Mr. Bodson earned a Master of Business Administration from Harvard Business School in the United States, where he was a Baker Scholar, and a master's degree in commercial engineering from the Solvay Business School (Belgium)/McGill University (Canada). He is a member of the board of directors of Electrocomponents PLC.

James (Jay) Bradner, M.D.
President of the Novartis Institutes for BioMedical Research (NIBR) | Nationality: American | Year of Birth: 1972
James (Jay) Bradner, M.D., has been President of the Novartis Institutes for BioMedical Research (NIBR) since 2016. He is a member of the Executive Committee of Novartis.
From 2005 through 2015, Dr. Bradner served on the research faculty of Harvard Medical School and as an attending physician in stem cell transplantation within the Department of Medical Oncology at the Dana-Farber Cancer Institute in the United States. He has co-founded five biotechnology companies and has co-authored more than 200 scientific publications and 30 US patent applications.
Dr. Bradner is a graduate of Harvard College and the University of Chicago Medical School in the US. He completed his residency in medicine at Brigham and Women's Hospital, his fellowship in medical oncology and hematology at the Dana-Farber Cancer Institute, and his postdoctoral training in chemistry and chemical biology at Harvard University. He has received many honorific awards and was elected into the American Society for Clinical Investigation in 2011 and the Alpha Omega Alpha Honor Medical Society in 2013.
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Richard Francis

CEO, Sandoz | Nationality: British | Year of Birth: 1968

Richard Francis has been CEO of Sandoz since 2014. He is a member of the Executive Committee of Novartis.

Mr. Francis joined Novartis from Biogen Idec, where he held global and country leadership positions during his 13-year career with the company. Most recently, he was senior vice president of the company's United States commercial organization. From 1998 to 2001, he was at Sanofi in the United Kingdom, and held various marketing roles across the company's urology, analgesics and cardiovascular products. He also held sales and marketing positions at Lorex Synthélabo and Wyeth.

Mr. Francis is a member of the board of directors of Mettler-Toledo International Inc., based in the US. He received a Bachelor of Arts in economics from Manchester Metropolitan University in the UK.

Paul Hudson

CEO, Novartis Pharmaceuticals | Nationality: British | Year of Birth: 1967

Paul Hudson has been CEO of Novartis Pharmaceuticals since 2016. He is a member of the Executive Committee of Novartis.

Mr. Hudson joined Novartis from AstraZeneca PLC, where he most recently was president, AstraZeneca United States and executive vice president, North America. He also served as representative director and president of AstraZeneca K.K. in Japan; as president of AstraZeneca's business in Spain; and as vice president and primary care director, United Kingdom. Before joining AstraZeneca in 2006, Mr. Hudson held roles of increasing responsibility at Schering-Plough, including leading biologics global marketing. He began his career in sales and marketing roles at GlaxoSmithKline UK and Sanofi-Synthélabo UK.

Mr. Hudson holds a degree in economics from Manchester Metropolitan University (MMU) in the UK and a diploma in marketing from the Chartered Institute of Marketing in the UK. In 2018, he was awarded an honorary doctorate in business administration from MMU. He is a board member of the European Federation of Pharmaceutical Industries and Associations (EFPIA) and vice chair of the Innovation Board Sponsored Committee of EFPIA.

Harry Kirsch

Chief Financial Officer of Novartis | Nationality: German/Swiss | Year of Birth: 1965

Harry Kirsch has been Chief Financial Officer (CFO) of Novartis since 2013. He is a member of the Executive Committee of Novartis.

Mr. Kirsch joined Novartis in 2003 and, prior to his current position, served as CFO of the Pharmaceuticals Division. Under his leadership, the division's core operating income margin increased, in constant currencies, every quarter of 2011 and 2012 despite patent expirations. At Novartis, he also served as CFO of Pharma Europe, and as Head of Business Planning & Analysis and Financial Operations for the Pharmaceuticals Division. Mr. Kirsch joined Novartis from Procter & Gamble (P&G) in the United States, where he was CFO of P&G's global pharmaceutical business. Prior to that, he held finance positions in various categories of P&G's consumer goods business, technical operations, and Global Business Services organization.

Mr. Kirsch holds a diploma degree in industrial engineering and economics from the University of Karlsruhe in Germany. From 2015 to 2018, he represented Novartis on the board of GlaxoSmithKline Consumer Healthcare Holdings Ltd.

Shannon Thyme Klinger

Group General Counsel of Novartis | Nationality: American | Year of Birth: 1971

Shannon Thyme Klinger has been Group General Counsel of Novartis since June 1, 2018. She is a member of the Executive Committee of Novartis.

Ms. Klinger most recently served as Chief Ethics, Risk and Compliance Officer, and was appointed to the Executive Committee of Novartis in this role. Before that, she was Chief Ethics and Compliance Officer and Global Head of Litigation. She joined Novartis in 2011 as General Counsel, North America, for Sandoz in the United States and later became the Global Head of Legal and General Counsel for Sandoz International GmbH. Prior to Novartis, Ms. Klinger worked in the US as a partner at Mayer Brown LLP from 2010 to 2011, senior vice president and general counsel for Solvay Pharmaceuticals Inc. from 2008 to 2010, and vice president of marketing compliance and associate counsel for Barr Laboratories/Duramed Pharmaceuticals from 2005 to 2007. She was also a partner at Alston & Bird LLP, where she focused on litigation and antitrust, pharmaceutical legal and regulatory matters.

Ms. Klinger holds a juris doctor with honors from the University of North Carolina at Chapel Hill and a bachelor's degree in psychology from the University of Notre Dame (both in the US). She is a member of the board of directors of the SIX Group.

Steffen Lang, Ph.D.

Global Head of Novartis Technical Operations | Nationality: German/Swiss | Year of Birth: 1967

Steffen Lang, Ph.D., has been Global Head of Novartis Technical Operations since April 2017. He is a member of the Executive Committee of Novartis.

Prior to his current appointment, Mr. Lang served as Global Head of Biologics Technical Development and Manufacturing within Novartis Technical Operations. He joined Novartis in 1994 as Head of Laboratory in Research, and over the years has held positions of increasing responsibility within Pharmaceuticals Development, including Head of Biotechnology Development and Global Head of Technical Research and Development.

Mr. Lang holds a doctorate in pharmaceutical technology from the Swiss Federal Institute of Technology (ETH Zurich) in Switzerland, and a master's degree in pharmaceutical sciences from the University of Heidelberg in Germany.

Klaus Moosmayer, Ph.D.
Chief Ethics, Risk and Compliance Officer of Novartis | Nationality: German | Year of Birth: 1968
Klaus Moosmayer, Ph.D., has been Chief Ethics, Risk and Compliance Officer of Novartis since December 1, 2018. He is a member of the Executive Committee of Novartis.
Mr. Moosmayer previously was chief compliance officer of Siemens AG, a position he held since 2014. During his 18-year career at Siemens, Mr. Moosmayer also served as chief counsel compliance, compliance operating officer and corporate legal counsel. Before joining Siemens, he practiced law in Germany, specializing in white-collar crime, litigation and business law.
Mr. Moosmayer received his doctor of jurisprudence from the University of Freiburg in Germany and is internationally recognized in the field of compliance. He is chair of the Anti-Corruption Task Force of the Business and Industry Advisory Committee at the Organization for Economic Co-operation and Development (OECD); co-founder and chair of the European Chief Compliance and Integrity Officers' Forum; former co-chair of the B20 Integrity & Compliance Task Force under the G20 presidency of Argentina; and former chair of the task force under the G20 presidency of Germany. Mr. Moosmayer lectures on compliance at the University of St.Gallen in Switzerland.
John Tsai, M.D.
Head of Global Drug Development and Chief Medical Officer for Novartis | Nationality: American | Year of Birth: 1967
John Tsai, M.D., has been Head of Global Drug Development and Chief Medical Officer for Novartis since May 1, 2018. He is a member of the Executive Committee of Novartis.
Dr. Tsai joined Novartis from Amgen Inc., where he was chief medical officer and senior vice president of Global Medical, overseeing all clinical and medical functions across multiple sites worldwide. Before joining Amgen in 2017, he spent 11 years at Bristol-Myers Squibb Co. (BMS), most recently as global head of clinical development for marketed products. During his time at BMS, Dr. Tsai also served as a full development team lead in oncology, head of Worldwide Medical, chief medical officer for Europe, vice president of US Medical, and vice president of Cardiovascular Medical. Prior to BMS, he was a cardiovascular group leader at Pfizer Inc. He started his career as an electrical engineer at General Electric Co.
Dr. Tsai holds a medical degree from the University of Louisville School of Medicine in the United States. He received a Bachelor of Science in electrical engineering from Washington University in St. Louis, also in the US.
Robert Weltevreden
Head of Novartis Business Services (NBS) | Nationality: Dutch | Year of Birth: 1969
Robert Weltevreden has been Head of Novartis Business Services (NBS) since June 1, 2018. He is a member of the Executive Committee of Novartis.
Mr. Weltevreden previously worked at Syngenta AG as head of its business services organization. He joined Syngenta in 2003 and has held other leadership positions, including head of business process management; head of finance services; and chief financial officer (CFO) of the Asia-Pacific region for Syngenta Crop Protection AG. Prior to Syngenta, Mr. Weltevreden worked at Newell Rubbermaid Inc. as vice president/controller of Rubbermaid Europe and as CFO of the Germany, Benelux and Scandinavia markets. He started his career as a corporate business analyst at Curver and later became CFO of the Iberia region.
Mr. Weltevreden holds a master's degree in international finance, economics and business administration from Erasmus University Rotterdam in the Netherlands. He also holds a Master of Business Administration in financial management from Vlerick Business School in Ghent, Belgium.

Member of the Executive Committee, effective January 1, 2019

Susanne Schaffert, Ph.D.
CEO, Novartis Oncology | Nationality: German | Year of Birth: 1967
Susanne Schaffert, Ph.D., has been CEO of Novartis Oncology since January 1, 2019. She is a member of the Executive Committee of Novartis.
Ms. Schaffert was appointed Chairperson and President of Advanced Accelerator Applications when it was acquired by Novartis in January 2018, and will remain President until her successor is in place. She joined Novartis more than

20 years ago and served as Region Head, Novartis Oncology Europe, from 2012 to 2018. Prior to that, she was Head of Investor Relations for Novartis. She has also held other leadership positions during her career at Novartis, including Global Franchise Head for Immunology and Infectious Diseases, General Manager of Novartis Oncology in Northern and Central Europe, and General Manager of Novartis Oncology in Germany.

Ms. Schaffert holds a doctorate in organic chemistry from the University of Erlangen in Germany. She is a member of the Board of Novartis AG Germany, and previously served on the board of GlaxoSmithKline Consumer Healthcare Holdings Ltd.

Secretary

Katja Roth Pellanda, Ph.D.

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Shareholder participation rights

Shareholders have the right to receive dividends, to vote and to execute all other rights as granted under Swiss law and the Articles of Incorporation (see, in particular, articles 17 and 18 of the Articles of Incorporation: www.novartis.com/investors/company-overview/corporate-governance).

Voting rights, restrictions and representation

Each Novartis share registered with the right to vote entitles the holder to one vote at General Meetings. To be registered with voting rights, a shareholder must declare that he or she acquired the shares in his or her own name and for his or her own account. According to article 5, paragraph 3 of the Articles of Incorporation (www.novartis.com/investors/company-overview/corporate-governance), the Board may register nominees with the right to vote (for registration of nominees, see "—Item 6.C Board practices—Our capital structure—Transferability and nominee registration").

The Articles of Incorporation provide that no shareholder shall be registered with the right to vote for more than 2% of the registered share capital. Given that shareholder representation at General Meetings traditionally has been rather low in Switzerland, Novartis AG considers registration restrictions necessary to prevent a minority shareholder from dominating a General Meeting. The Board may, upon request, grant an exemption from this restriction. Considerations include whether the shareholder supports the Novartis goal of creating sustainable value and has a long-term investment horizon. Exemptions are in force for the registered significant shareholders listed in "—Item 6.C Board practices—Our Group structure and shareholders—Our shareholders—Significant shareholders," and for Norges Bank (Central Bank of Norway), Oslo, which as of December 31, 2018, was not registered in the share register but according to a disclosure notification filed with Novartis AG, held 2.1% of the share capital of Novartis AG. No further exemptions were requested in 2018.

The same registration and voting restrictions indirectly apply to holders of ADRs. Shareholders, ADR holders, or nominees who are linked to each other or who act in concert to circumvent registration restrictions are treated as one person or nominee for the purposes of the restrictions on registration.

Shareholders can vote their Novartis shares by themselves or appoint another shareholder or the Independent Proxy to vote on their behalf. All shareholders (who are not yet registered on the online platform; see below) receive a General Meeting invitation letter with a proxy appointment form for the appointment of the Independent Proxy. On this form, shareholders can instruct the Independent Proxy to vote on alternative or additional motions related to the agenda items either (i) following the recommendations of the Board for such alternative or additional motions, or (ii) against such alternative or additional motions. They can also abstain from voting.

Novartis AG offers shareholders the opportunity to use an online platform (the Sherpany Platform) to receive invitations to future General Meetings exclusively by email and to electronically give their instructions to the Independent Proxy, grant powers of attorney to other shareholders, and order their admission cards online. The General Meeting registration form enables shareholders who are not yet registered on the Sherpany Platform to order detailed documents related to opening an account. They may also do so by contacting the Novartis Share Registry. Shareholders can deactivate their online account at any time and again receive invitations in paper form.

An ADR holder has the rights enumerated in the deposit agreement (such as the right to give voting instructions and to receive dividends). The ADS depositary of Novartis AG – JPMorgan Chase Bank, N.A., New York – holds the Novartis shares underlying the ADRs and is registered as a shareholder in the Novartis Share Register. An ADR is not a Novartis share, and an ADR holder is not a Novartis AG shareholder. Each ADR represents one Novartis share. ADR holders exercise their voting rights by instructing the depositary to exercise their voting rights. JPMorgan Chase Bank, N.A., exercises the voting rights for registered Novartis shares underlying ADRs for which no voting instructions have been given by providing a discretionary proxy to an uninstructed independent designee. Such designee has to be a Novartis AG shareholder.

Powers of the General Meeting

The following powers are vested exclusively in the General Meeting:

• Adoption and amendment of the Articles of Incorporation

• Election and removal of the Chairman of the Board, Board and Compensation Committee members, the Independent Proxy and external auditors

• Approval of the management report (if required) and of the consolidated financial statements

• Approval of the financial statements of Novartis AG, and decision on the appropriation of available earnings shown on the balance sheet, including dividends
• Approval of the maximum aggregate amounts of compensation of the Board (for the period from an AGM until the next AGM) and of the Executive Committee (for the financial year following the AGM)
• Grant of discharge to Board and Executive Committee members
• Decision on other matters that are reserved by law or by the Articles of Incorporation (e.g., advisory vote on the Compensation Report) to the General Meeting of Shareholders

Statutory quorums

The General Meeting passes resolutions and elections with the absolute majority of the votes represented at the meeting. However, under article 18 of the Articles of

Incorporation (www.novartis.com/investors/company-overview/corporate-governance), the approval of two-thirds of the votes represented at the meeting is required for:

• Alteration of the purpose of Novartis AG
• Creation of shares with increased voting powers
• Implementation of restrictions on the transfer of registered shares, and the removal of such restrictions
• Authorized or conditional increase of the share capital
• Increase of the share capital out of equity, by contribution in kind, for the purpose of an acquisition of property or the grant of special rights
• Restriction or suspension of rights or options to subscribe
• Change of location of the registered office of Novartis AG
• Dissolution of Novartis AG

In addition, the law provides for a qualified majority for other resolutions, such as a merger or demerger.

Convocation of General Meetings

The AGM must be held within six months after the close of the financial year (December 31), and normally takes place at the end of February or the beginning of March. Extraordinary General Meetings may be convened upon the request of the Board, the auditors, or shareholders representing at least 10% of the Novartis share capital.

Agenda

Shareholders representing Novartis shares with an aggregate nominal value of at least CHF 1 million may request that an item be included in a General Meeting agenda. Such requests must be made in writing at least 45 days before the meeting, specify the agenda item to be included, and contain the proposal on which the shareholder requests a vote.

Registration in the Novartis Share Register

The Novartis Share Register is an internal, non-public register subject to statutory confidentiality, and privacy and data protection imposed on Novartis to protect registered shareholders. Novartis shares can only be voted if they are registered with voting rights in such register by the third business day before the General Meeting.

Change-of-control and defense measures

Duty to make an offer

According to the Swiss Federal Act on Financial Infrastructures, anyone who – directly, indirectly or acting in concert with third parties – acquires equity securities exceeding 33 1/3% of the voting rights of a company (whether or not such rights are exercisable) is required to make an offer to acquire all listed equity securities of that company. A company may raise this threshold up to 49% of the voting rights ("opting up") or may, under certain circumstances, waive the threshold ("opting out"). Novartis AG has not adopted any such measures.

Clauses on change of control

In accordance with good corporate governance and the rules of the Ordinance against Excessive Compensation in Listed Companies, there are no change-of-control clauses and "golden parachute" agreements benefiting Board members, Executive Committee members, or other members of senior management. Furthermore, employment contracts with Executive Committee members are either for a fixed term not exceeding one year or for an indefinite period of time with a notice period not exceeding 12 months, and do not contain commissions for the acquisition or transfer of enterprises or severance payments.

Auditors

Duration of the mandate and terms of office of the auditors

Based on a recommendation by the Audit and Compliance Committee, the Board nominates an independent auditor for election at the AGM. PricewaterhouseCoopers (PwC) assumed its existing auditing mandate for Novartis in 1996. Luc Schulthess, auditor in charge, began serving in his role in 2018, and Stephen Johnson, global relationship partner, began serving in his role in 2014. The Audit and Compliance Committee together with PwC ensures that these partners are rotated at least every five years.

Auditing fees and additional fees

PwC fees for professional services related to the 12-month periods ended December 31, 2018, and December 31, 2017, are as follows:

	2018 USD million	2017 USD million
Audit services	25.6	24.6
Audit-related services	13.4	7.2
Tax services	0.7	0.8
Other services	2.4	1.4
Total	42.1	34.0

Audit services include work performed to issue opinions on consolidated financial statements and parent company financial statements of Novartis AG, to issue opinions related to the effectiveness of the Group's internal control over financial reporting, and to issue reports on local statutory financial statements. Also included are audit services that generally can only be provided by the statutory auditor, such as the audit of the Compensation Report, audits of the adoption of new accounting policies, audits of information systems and the related control environment, as well as reviews of quarterly financial results.

Audit-related services include other assurance services provided by the independent auditor but not restricted to those that can only be provided by the statutory auditor. They include services such as audits of pension and other employee benefit plans, audits in connection with non-recurring transactions, including audit services related to the Alcon strategic review, contract audits of third-party arrangements, corporate responsibility assurance, and other audit-related services.

Tax services represent tax compliance, assistance with historical tax matters, and other tax-related services.

Other services include procedures related to corporate integrity agreements, training in the finance area, benchmarking studies, and license fees for use of accounting and other reporting guidance databases.

Information to the Board and the Audit and Compliance Committee

The Audit and Compliance Committee, acting on behalf of the Board, is responsible for overseeing the activities of PwC. In 2018, this committee held seven meetings. PwC was invited to all of these meetings to attend the discussions on auditing matters and any other matters relevant to its audit.

The Audit and Compliance Committee recommended to the Board to approve the audited consolidated financial statements and the separate parent company financial statements of Novartis AG for the year ended December 31, 2018. The Board proposed the acceptance of these financial statements for approval by the shareholders at the next AGM.

The Audit and Compliance Committee regularly evaluates the performance of PwC and, based on this, once a year determines whether PwC should be proposed to the shareholders for election. To assess the performance of PwC, the Audit and Compliance Committee holds private meetings with the CFO and the Global Head of Novartis Business Assurance & Advisory/Internal Audit and, if necessary, obtains an independent external assessment. Criteria applied for the performance assessment of PwC include an evaluation of its technical and operational competence; its independence and objectivity; the sufficiency of the resources it has employed; its focus on areas of significant risk to Novartis; its willingness to probe and challenge; its ability to provide effective, practical recommendations; and the openness and effectiveness of its communications and coordination with the Audit and Compliance Committee, the

Internal Audit function and management.
Once a year, the auditor in charge and the global relationship partner report to the Board on PwC's activities during the current year and on the audit plan for the coming year.
On an annual basis, PwC provides the Audit and Compliance Committee with written disclosures required by the US Public Company Accounting Oversight Board, and the committee and PwC discuss PwC's independence from Novartis.
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Information policy

Novartis is committed to open and transparent communication with shareholders, financial analysts, customers, suppliers and other stakeholders. Novartis disseminates information about material developments in its businesses in a broad and timely manner that complies with the rules of the SIX Swiss Exchange and the NYSE.

Shareholder relations

The CEO, with the CFO and Investor Relations team, supported by the Chairman, are responsible for ensuring effective communication with shareholders to keep them informed of the Company's strategy, prospects, business operations and governance. Through communication, the Board also learns about and addresses shareholders' expectations and concerns.

Topics discussed with shareholders may include strategy, business performance and corporate governance, while fully respecting all applicable laws and stock exchange rules.

At the AGM, the Chairman and other Board members, the CEO and other Executive Committee members, and representatives of the external auditors are present and can answer shareholders' questions.

Information for our stakeholders

Communications

Novartis publishes this Annual Report to provide information on the Group's results and operations. Novartis discloses financial results in accordance with IFRS on a quarterly basis, and issues press releases from time to time regarding business developments.

Novartis furnishes press releases related to financial results and material events to the SEC via Form 6-K. An archive containing Annual Reports, US Securities and Exchange Commission Form 20-F, quarterly results releases, and all related materials – including presentations and conference call webcasts – is on the Novartis website at www.novartis.com/investors.

Novartis also publishes a Novartis in Society report, available on the Novartis website at www.novartis.com/our-company/corporate-responsibility, which details progress and demonstrates the Company's commitment to be a leader in corporate responsibility. This report reflects the best-in-class reporting standard, the Global Reporting Initiative's G4 guidelines, and fulfills the Company's reporting requirement as a signatory of the UN Global Compact.

Information contained in reports and releases issued by Novartis is only correct and accurate at the time of release. Novartis does not update past releases to reflect subsequent events, and advises against relying on them for current information.

Investor Relations program

Investor Relations manages the Group's interactions with the international financial community. Several events are held each year to provide institutional investors and analysts with various opportunities to learn more about Novartis. Investor Relations is based at the Group's headquarters in Basel. Part of the team is located in the US to coordinate interaction with US investors. More information is available on the Novartis website: www.novartis.com/investors. Investors are also welcome to subscribe to a free email service on this site.

Website information

Topic	Information
Share capital	Articles of Incorporation of Novartis AG www.novartis.com/investors/company-overview/corporate-governance Novartis key share data www.novartis.com/key-share-data
Shareholder rights	Articles of Incorporation of Novartis AG www.novartis.com/investors/company-overview/corporate-governance Investor Relations information www.novartis.com/investors
Board regulations	Board regulations www.novartis.com/investors/company-overview/corporate-governance
Executive Committee	Executive Committee www.novartis.com/our-company/executive-committee

Novartis code for senior financial officers	Novartis Code of Ethical Conduct for CEO and Senior Financial Officers www.novartis.com/investors/company-overview/corporate-governance
Novartis in Society	Novartis in Society www.novartis.com/nisreport2018
Additional information	Novartis Investor Relations www.novartis.com/investors

6.D Employees

The table below sets forth the breakdown of the total year-end number of our full-time equivalent employees by main category of activity and geographic area for the past three years.

For the year ended December 31, 2018 (full-time equivalents)	Marketing and sales	Production and supply	Research and development	NBS [1]	General and administration	Total
USA	6 825	7 524	6 700	1 467	911	23 427
Canada and Latin America	4 584	960	508	899	490	7 441
Europe	19 608	21 397	10 049	4 845	2 780	58 679
Asia/Africa/Australasia	20 099	6 636	3 977	3 613	1 289	35 614
Total	51 116	36 517	21 234	10 824	5 470	125 161

For the year ended December 31, 2017 (full-time equivalents)	Marketing and sales	Production and supply	Research and development	NBS [1]	General and administration	Total
USA	6 563	7 095	6 803	1 680	726	22 867
Canada and Latin America	4 477	1 305	557	900	471	7 710
Europe	18 665	20 412	10 173	4 903	2 469	56 622
Asia/Africa/Australasia	19 005	6 970	3 883	3 386	1 154	34 398
Total	48 710	35 782	21 416	10 869	4 820	121 597

For the year ended December 31, 2016 (full-time equivalents)	Marketing and sales	Production and supply	Research and development	NBS [1]	General and administration	Total
USA	6 615	6 836	7 363	1 517	706	23 037
Canada and Latin America	4 430	1 404	516	841	491	7 682
Europe	18 034	19 807	10 208	4 683	2 473	55 205
Asia/Africa/Australasia	17 825	7 029	3 504	3 007	1 104	32 469
Total	46 904	35 076	21 591	10 048	4 774	118 393

[1] NBS relates to full-time equivalent employees from our Novartis Business Services organizational unit.

A significant number of our associates are represented by unions or works councils. We have not experienced any material work stoppages in recent years, and we consider our employee relations to be good.

6.E Share ownership

The aggregate amount of our shares owned by our Directors and the members of our Executive Committee in 2018 (including persons closely linked to them) as of December 31, 2018, was 1,295,974 shares. This excludes certain unvested equity rights (such as restricted share units, performance share units and similar instruments) but includes unvested restricted shares because our unvested restricted shares can be voted. With respect to any Directors and members of our Executive Committee who stepped down during 2018, this information is reported as of the date they stepped down.

For more information on the Novartis shares, share options and other equity-based instruments owned by individual members of our Executive Committee and by our current Directors, see the information set forth under “Item 6. Directors, Senior Management and Employees—Item 6.B Compensation—Compensation Report—2018 Executive Committee compensation—Additional disclosures—Shares, ADRs and other equity rights owned by Executive Committee members at December 31, 2018” and under “Item 6. Directors, Senior Management and Employees—Item 6.B

Compensation—Compensation Report—2018 Board compensation—Additional disclosures—Shares, ADRs and share options owned by Board members," which are incorporated by reference. For more information on our equity-based participation plans, see the information set forth under "Item 18. Financial Statements—Note 25. Equity-based participation plans for associates," which is incorporated by reference.

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Item 7. Major Shareholders and Related Party Transactions

7.A Major shareholders

Novartis shares are widely held. As of December 31, 2018, Novartis had approximately 163,000 shareholders listed in the Novartis AG Share Register, representing approximately 69.2% of issued shares. Based on the Novartis AG Share Register and excluding treasury shares, approximately 42.1% of the shares registered by name were held in Switzerland, and approximately 26.8% were held in the US. Approximately 12.9% of the shares registered in our share register were held by individual investors, while approximately 32.6% were held by legal entities (excluding 4.6% of our share capital held as treasury shares by Novartis AG and its subsidiaries), nominees, fiduciaries and the ADS depositary.

Based on our share register, we believe that we are not directly or indirectly owned or controlled by another corporation or government, or by any other natural or legal persons. There are no arrangements that may result in a change of control.

2018

According to our share register, as of December 31, 2018, excluding 4.6% of our share capital held as treasury shares by Novartis AG and its subsidiaries, the following registered shareholders (including nominees and the ADS depositary) held more than 2% of the total share capital of Novartis with the right to vote all their Novartis shares based on an exemption granted by the Board of Directors:

• Shareholders: Novartis Foundation for Employee Participation, with its registered office in Basel, Switzerland, holding 2.3%; Emasan AG, with its registered office in Basel, Switzerland, holding 3.5%; and UBS Fund Management (Switzerland) AG, with its registered office in Basel, Switzerland, holding 2.2%;

• Nominees: Chase Nominees Ltd., London, England (holding 9.8%); Nortrust Nominees Ltd., London, England (holding 3.6%); and The Bank of New York Mellon, New York, NY (holding 4.1%) through its nominees, The Bank of New York Mellon, Everett, MA (holding 2.1%), The Bank of New York Mellon, New York, holding 1.3%, and The Bank of New York Mellon, SA/NV, Brussels, Belgium (holding 0.7%); and

• ADS depositary: JPMorgan Chase Bank, N.A., New York, NY (holding 13.3%).

According to a disclosure notification filed with Novartis AG, Norges Bank (Central Bank of Norway), Oslo, Norway, held 2.1% of the share capital of Novartis AG as of December 31, 2018, with the right to vote all its Novartis shares, but was not registered in our share register as of December 31, 2018.

According to a disclosure notification filed with Novartis AG and the SIX Swiss Exchange, each of BlackRock, Inc., New York, NY, and Capital Group Companies, Inc., Los Angeles, CA, held between 3% and 5% of the share capital of Novartis AG but was registered with less than 2% of the share capital in our share register as of December 31, 2018.

As of December 31, 2018, no other shareholder was registered as owner of more than 2% of the registered share capital.

The Articles of Incorporation provide that no shareholder shall be registered with the right to vote shares comprising more than 2% of the registered share capital. The Board of Directors may, upon request, grant an exemption from this restriction. Considerations include whether the shareholder supports the Novartis goal of creating sustainable value and has a long-term investment horizon. Exemptions are in force for the registered major shareholders as described above. Novartis has not entered into any agreement with any shareholder regarding the voting or holding of Novartis shares.

2017

According to our share register, as of December 31, 2017, excluding 6.4% of our share capital held as treasury shares by Novartis AG and its subsidiaries, the following registered shareholders (including nominees and the ADS depositary) held more than 2% of the total share capital of Novartis with the right to vote all their Novartis shares based on an exemption granted by the Board of Directors:

• Shareholders: Novartis Foundation for Employee Participation, with its registered office in Basel, Switzerland, holding 2.5%; Emasan AG, with its registered office in Basel, Switzerland, holding 3.4%; and UBS Fund Management (Switzerland) AG, with its registered office in Basel, Switzerland, holding 2.0%;

• Nominees: Chase Nominees Ltd., London, England (holding 7.8%); Nortrust Nominees Ltd., London, England (holding 3.8%); and The Bank of New York Mellon, New York, NY (holding 4.3%) through its nominees, The Bank of New York Mellon, Everett, MA (holding 2.0%), and The Bank of New York Mellon, SA/NV, Brussels, Belgium (holding 2.3%); and
• ADS depositary: JPMorgan Chase Bank, N.A., New York, NY (holding 12.3%).
According to a disclosure notification filed with Novartis AG, Norges Bank (Central Bank of Norway), Oslo, Nor-
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way, held 2.1% of the share capital of Novartis AG as of December 31, 2017, with the right to vote all its Novartis shares, but was not registered in our share register as of December 31, 2017.
According to a disclosure notification filed with Novartis AG and the SIX Swiss Exchange, BlackRock, Inc., New York, NY, held between 3% and 5% of the share capital of Novartis AG but was registered with less than 2% of the share capital in our share register as of December 31, 2017.
As of December 31, 2017, no other shareholder was registered as owner of more than 2% of the registered share capital.
The Articles of Incorporation provide that no shareholder shall be registered with the right to vote shares comprising more than 2% of the registered share capital. The Board of Directors may, upon request, grant an exemption from this restriction. Considerations include whether the shareholder supports the Novartis goal of creating sustainable value and has a long-term investment horizon. Exemptions are in force for the registered major shareholders as described above. Novartis has not entered into any agreement with any shareholder regarding the voting or holding of Novartis shares.
2016
According to our share register, as of December 31, 2016, excluding 4.5% of our share capital held as treasury shares by Novartis AG and its subsidiaries, the following registered shareholders (including nominees and the ADS depositary) held more than 2% of the total share capital of Novartis with the right to vote these shares:
• Shareholders: Novartis Foundation for Employee Participation, with its registered office in Basel, Switzerland, holding 2.6%; Emasan AG, with its registered office in Basel, Switzerland, holding 3.4%; and UBS Fund Management (Switzerland) AG, with its registered office in Basel, Switzerland, holding 2.1%;
• Nominees: Chase Nominees Ltd., London, England (holding 8.5%); Nortrust Nominees, London, England (holding 3.9%); and The Bank of New York Mellon, New York, NY (holding 4.4%) through its nominees, Mellon Bank, Everett, MA (holding 1.8%) and The Bank of New York Mellon, Brussels, Belgium (holding 2.6%); and
• ADS depositary: JPMorgan Chase Bank, New York, NY (holding 12%).
According to a disclosure notification filed with Novartis AG, Norges Bank (Central Bank of Norway), Oslo, Norway, held 2.02% of the share capital of Novartis AG as of December 31, 2016, with the right to vote all its Novartis shares, but was not registered in our share register as of December 31, 2016.
According to disclosure notifications filed with Novartis AG and the SIX Swiss Exchange, each of the following shareholders held between 3% and 5% of the share capital of Novartis AG as of December 31, 2016:
• Capital Group Companies, Inc., Los Angeles, CA; and
• BlackRock, Inc., New York, NY.
As of December 31, 2016, no other shareholder was registered as owner of more than 2% of the registered share capital. Novartis has not entered into any agreement with any shareholder regarding the voting or holding of Novartis shares.

7.B Related party transactions

The information set forth under “Item 18. Financial Statements—Note 26. Transactions with related parties” is incorporated by reference.

7.C Interests of experts and counsel

Not applicable.

Item 8. Financial Information

8.A Consolidated statements and other financial information

See “Item 18. Financial Statements.”

Dividend policy

Subject to the dividend policy described below, our Board of Directors expects to recommend the payment of a dividend in respect of each financial year. If approved by our shareholders at the relevant annual shareholders’ meeting, the dividends will be payable shortly following such approval. Any shareholder who purchases our shares before the ex-dividend date and holds the shares until that date shall be deemed to be entitled to receive the dividends approved at that meeting. Dividends are reflected in our financial statements in the year in which they are approved by our shareholders.

Our dividend policy is to pay a growing annual dividend in Swiss francs. This policy is subject to our financial conditions and outlook at the time, the results of our operations, and other factors.

The Board will propose a dividend of CHF 2.85 per share to the shareholders for approval at the Annual General Meeting to be held on February 28, 2019. Because we pay dividends in Swiss francs, exchange rate fluctuations will affect the US dollar amounts received by holders of ADRs. For a summary of dividends we paid in the past five years, see “Item 3. Key Information—Item 3.A Selected financial data—Cash dividends per share.” See also “Item 3. Key Information—Item 3.D Risk factors—The price of our ADRs and the US dollar value of any dividends may be negatively affected by fluctuations in the US dollar/Swiss franc exchange rate.”

Disclosure pursuant to Section 219 of the Iran Threat Reduction & Syria Human Rights Act (ITRA)

At Novartis, our purpose is to reimagine medicine to improve and extend people’s lives, regardless of where they live. This includes the compliant sale of medicines and other healthcare products worldwide. To help us fulfill this mission, we have two representative offices located in Iran.

As of October 18, 2010, a non-US affiliate within our Innovative Medicines Division entered into a non-binding Memorandum of Understanding (MoU) with the Ministry of Health and Medical Education of the Islamic Republic of Iran. Pursuant to the MoU, the Iranian Ministry of Health acknowledges certain benefits that may apply to sales of certain Innovative Medicines Division medicines by third-party distributors in Iran. These include fast-track registration, market exclusivity, end-user subsidies, and exemptions from customs tariffs. Novartis receives no payments from the Iranian Ministry of Health under the MoU, and the MoU creates no obligations on the part of either Novartis or the Iranian Ministry of Health.

From time to time, including in 2018, non-US affiliates in our Innovative Medicines and Sandoz Divisions made payments to government entities in Iran related to patents, trademarks, exit fees and other transactions ordinarily incident to travel by doctors and other medical professionals resident in Iran to attend conferences or other events outside Iran.

From time to time, including in 2018, non-US affiliates in our Innovative Medicines and Sandoz Divisions enter into agreements with hospitals, research institutes, medical associations and universities in Iran to provide grants and sponsor congresses, seminars and symposia, and with doctors and other healthcare professionals for consulting services, including participation in advisory boards and investigator services for observational (non-interventional) studies. Some of these hospitals and research institutes are owned or controlled by the government of Iran, and some of these doctors and healthcare professionals are employed by hospitals that may be public or government-owned.

Because our Innovative Medicines and Sandoz Divisions have operations in Iran, including employees, they obtain services and have other dealings incidental to their activities in that country, including paying taxes and salaries either directly or indirectly through a service provider, and obtaining office rentals, insurance, electricity, water and telecommunications services, office and similar supplies, and customs-related services from Iranian companies that may be owned or controlled by the government of Iran. In addition, from time to time, representatives of our non-US affiliates participate in meetings with Iranian officials to discuss issues relevant to our business and the pharmaceutical industry.

In 2018, a non-US affiliate in our Sandoz Division coordinated a training of government pharmaceutical regulators at a one-day workshop requested by the Iranian Food and Drug Organization to discuss regulatory pathways for

biosimilar medicines in Iran.

Non-US affiliates in our Innovative Medicines and Sandoz Divisions maintain local accounts at banks that are, as of November 5, 2018, on the Specially Designated Nationals and Blocked Persons List (SDN List). These non-US affiliates make local transactions for employee payroll and local vendor payment purposes only with SDN-listed Iranian banks that are not subject to secondary sanctions. Payments to employees and vendors are only made to accounts in Iranian banks that are not subject to secondary sanctions.

8.B Significant changes

None.

Item 9. The Offer and Listing

9.A Offer and listing details

Our shares are listed in Switzerland on the SIX Swiss Exchange (SIX).
American Depositary Shares (ADSs), each representing one share, have been available in the US through an American Depositary Receipt (ADR) program since December 1996. This program was established pursuant to a deposit agreement that we entered into with JPMorgan Chase Bank, N.A., as depositary (Deposit Agreement). Our ADRs have been listed on the New York Stock Exchange (NYSE) since May 2000 and are traded under the symbol NVS. The depositary has informed us that as of January 22, 2019, there were 337 million ADRs outstanding, each representing one Novartis share (approximately 13% of total Novartis shares issued). On January 22, 2019, the closing price per share on the SIX was CHF 88.14 and USD 88.32 per ADR on the NYSE.

9.B Plan of distribution

Not applicable.

9.C Markets

See “—Item 9.A Offer and listing details.”

9.D Selling shareholders

Not applicable.

9.E Dilution

Not applicable.

9.F Expenses of the issue

Not applicable.

Item 10. Additional Information

10.A Share capital

Not applicable.

10.B Memorandum and articles of association

The following is a summary of certain provisions of our Articles of Incorporation ("Articles"), our Regulations of the Board of Directors ("Board Regulations") and of Swiss law, particularly the Swiss Code of Obligations ("Swiss CO"). This is not a summary of all the significant provisions of the Articles, the Board Regulations or of Swiss law and does not purport to be complete. This description is qualified in its entirety by reference to the Articles and the Board Regulations, which are an exhibit to this Form 20-F, and to Swiss law.

10.B.1 Company purpose

Novartis AG is registered in the commercial register of the canton of Basel-Stadt, Switzerland, under number CHE-103.867.266. Our business purpose, as stated in Article 2 of the Articles, is to hold interests in enterprises in the area of healthcare or nutrition. We may also hold interests in enterprises in the areas of biology, chemistry, physics, information technology or related areas. We may acquire, mortgage, liquidate or sell real estate and intellectual property rights in Switzerland or abroad. In pursuing our business purpose, we strive to create sustainable value.

10.B.2 Directors

(a) According to our Board Regulations, a member of our Board ("Director") may not participate in deliberations or resolutions on matters that affect, or reasonably might affect, the Director's interests or the interests of a person close to the Director. In addition, the Swiss CO sets forth that if, in connection with the conclusion of a contract, Novartis AG is represented by the person with whom it is concluding the contract, such contract shall be in writing. Furthermore, the Swiss CO requires directors and members of senior management to safeguard the interests of the corporation and, in this connection, imposes a duty of care and a duty of loyalty on such individuals. This rule is generally interpreted to mean that directors and members of senior management are disqualified from participating in decisions that affect them personally.

(b) A Board resolution requires the affirmative majority of the votes cast. As with any Board resolution, Directors may not vote on their own compensation unless at least a majority of the Directors are present. The compensation of the Directors is subject to the approval of the aggregate amounts of such compensation by a shareholders' resolution under the Ordinance against Excessive Compensation in Public Companies of the Swiss Federal Council.

(c) The Articles prohibit the granting of loans or credits to Directors.

(d) Directors who have turned 70 years of age at the date of the General Meeting of Shareholders may no longer be elected as members of the Board. The General Meeting of Shareholders may, under special circumstances, grant an exemption from this rule.

(e) Our Directors are not required to be shareholders under our Articles.

10.B.3 Shareholder rights

Because Novartis AG has only one class of registered shares, the following information applies to all shareholders.

(a) The Swiss CO requires that, among other things, at least 5% of our annual profit be retained as general reserves, so long as these reserves amount to less than 20% of our registered share capital. Swiss law and the Articles permit us to accrue additional reserves.

Under the Swiss CO, we may only pay dividends out of balance sheet profits, out of reserves created for this purpose, or out of free reserves. In any event, under the Swiss CO, while the Board may propose that a dividend be paid, we may only pay dividends upon shareholders' approval at a General Meeting of Shareholders. Our auditors must confirm that the dividend proposal of our Board conforms with the Swiss CO and the Articles. Our Board intends to propose a dividend once each year. See "Item 3. Key Information—Item 3.A. Selected financial data—Cash dividends per share" and "Item 8. Financial Information—Item 8.A. Consolidated statements and other financial information—Dividend policy." Dividends are usually due and payable shortly after the shareholders have passed a resolution approving the payment. Dividends that have not been claimed within five years after the due date revert to us, and are allocated to our general

reserves. For information about deduction of the withholding tax or other duties from dividend payments, see "—Item 10.E Taxation."

(b) Each share is entitled to one vote at a General Meeting of Shareholders. Voting rights may only be exercised for shares registered with the right to vote on

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the record date for the applicable General Meeting of Shareholders. In order to do so, the shareholder must file a share registration form with us, setting forth the shareholder's name, address and citizenship (or, in the case of a legal entity, its registered office). If the shareholder has not timely filed the form, then the shareholder may not vote at, or participate in, General Meetings of Shareholders.

To vote its shares, the shareholder must also explicitly declare that it has acquired the shares in its own name and for its own account. If the shareholder refuses to make such a declaration, the shares may not be voted unless the Board recognizes such shareholder as a nominee.

The Articles provide that no shareholder shall be registered with the right to vote shares comprising more than 2% of the registered share capital. The Board may, upon request, grant an exemption from this restriction. Considerations include whether the shareholder supports our goal of creating sustainable value and has a long-term investment horizon. Furthermore, the Articles provide that no nominee shall be registered with the right to vote shares comprising more than 0.5% of the registered share capital. The Board may, upon request, grant an exemption from this restriction if the nominee discloses the names, addresses and number of shares of the persons for whose account it holds more than 0.5% of the registered share capital. The same restrictions indirectly apply to holders of ADRs. We have in the past granted exemptions from the 2% rule for shareholders and the 0.5% rule for nominees. Under the Articles, the Board may delegate the power to grant such exemptions. The Board has delegated this power to the Chairman of the Board.

For purposes of the 2% rule for shareholders and the 0.5% rule for nominees, groups of companies and groups of shareholders acting in concert are considered to be one shareholder. These rules also apply to shares acquired or subscribed by the exercise of subscription, option or conversion rights.

After hearing the registered shareholder or nominee, the Board may cancel, with retroactive effect as of the date of registration, the registration of the shareholders if the registration was effected based on false information.

Registration restrictions in the Articles may only be removed upon a resolution carrying a two-thirds majority of the votes represented at a General Meeting of Shareholders.

Except as noted in the paragraph immediately below, shareholders' resolutions require the approval of a majority of the votes present at a General Meeting of Shareholders. As a result, abstentions have the effect of votes against such resolutions. Some examples of shareholders' resolutions requiring a vote by such "absolute majority of the votes" are (1) amendments to the Articles; (2) elections of Directors, the Chairman, the Compensation Committee members, the Independent Proxy and the statutory auditors; (3) approval of the management report and the financial statements; (4) setting the annual dividend, if any; (5) approval of the aggregate amounts of compensation of the Directors and the members of the Executive Committee; (6) decisions to discharge Directors and management from liability for matters disclosed to the General Meeting of Shareholders; and (7) the ordering of an independent investigation into specific matters proposed to the General Meeting of Shareholders. As a matter of Swiss law, certain other matters require a supermajority as well, including certain mergers, scissions and transformations under the Swiss Merger Act.

According to the Articles and Swiss law, the following types of shareholders' resolutions require the approval of a "supermajority" of at least two-thirds of the votes present at a General Meeting of Shareholders: (1) an alteration of our corporate purpose; (2) the creation of shares with increased voting powers; (3) an implementation of restrictions on the transfer of registered shares and the removal of such restrictions; (4) an authorized or conditional increase of the share capital; (5) an increase of the share capital by conversion of equity, by contribution in kind, or for the purpose of an acquisition of property or the grant of special rights; (6) a restriction or an exclusion of shareholders' pre-emptive rights; (7) a change of our registered office; (8) our dissolution; or (9) any amendment to the Articles that would create or eliminate a supermajority requirement.

Our shareholders are required to annually elect all of the members of the Board, as well as the Chairman of the Board, the members of the Compensation Committee, and the Independent Proxy. The Articles do not provide for cumulative voting of shares.

At General Meetings of Shareholders, shareholders can be represented by proxy. However, a proxy must either be: the shareholder's legal representative, another shareholder with the right to vote, or the Independent Proxy. Votes are taken either by a show of hands or by electronic voting, unless the General Meeting of Shareholders resolves to have a ballot or where a ballot is ordered by the chairman of the meeting.

American Depositary Shares (ADSs), each representing one Novartis AG share and evidenced by American Depositary Receipts (ADRs), are issued by our depositary JPMorgan Chase Bank, N.A., New York, and not by us.

The ADR is vested with rights defined and enumerated in the Deposit Agreement (such as the rights to vote, to receive a dividend and to receive a share of Novartis AG in exchange for a certain number of ADRs). The enumeration of rights, including any limitations on those rights in the Deposit Agreement, is final. There are no other rights given to the ADR holders. Only the ADS depositary, holding our shares underlying the ADRs, is registered as shareholder in our share register. An ADR is not a Novartis AG share and an ADR holder is not a Novartis AG shareholder.

The Deposit Agreement between our depositary, the ADR holder and us has granted certain indirect rights to vote to the ADR holders. ADR holders may not attend Novartis AG general meetings in person. ADR holders exercise their voting rights by instructing JPMorgan Chase Bank, N.A., our depositary, to exercise the voting rights attached to the registered shares underlying the ADRs. Each ADR represents one Novartis AG share. JPMorgan Chase Bank exer-

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cises the voting rights for registered shares underlying ADRs for which no voting instructions have been given by providing a discretionary proxy to an uninstructed independent designee pursuant to paragraph 13 of the form of ADR. Such designee has to be a shareholder of Novartis AG. The same voting restrictions apply to ADR holders as to those holding Novartis AG shares (i.e., the right to vote up to 2% of the Novartis AG registered share capital – unless otherwise granted an exemption by the Board – and the disclosure requirement for nominees).

(c) Shareholders have the right to allocate the profit shown on our balance sheet and to distribute dividends by vote taken at the General Meeting of Shareholders, subject to the legal requirements described in "Item 10.B.3(a) Shareholder rights."

(d) Under the Swiss CO, any surplus arising out of a liquidation of Novartis AG (i.e., after the settlement of all claims of all creditors) would be distributed to the shareholders in proportion to the paid-in nominal value of their shares.

(e) The Swiss CO limits a corporation's ability to hold or repurchase its own shares. We and our subsidiaries may only repurchase shares if we have freely disposable equity, in the amount necessary for this purpose, available. The aggregate nominal value of all Novartis AG shares held by us and our subsidiaries may not exceed 10% of our registered share capital. However, it is accepted that a corporation may repurchase its own shares beyond the statutory limit of 10%, if the repurchased shares are clearly earmarked for cancellation. In addition, we are required to recognize a negative position for own shares acquired by Novartis AG or if our subsidiaries acquire our shares, to create a special reserve on our balance sheet, in each case in the amount of the purchase price of the acquired shares. Repurchased shares held by us or our subsidiaries do not carry any rights to vote at a General Meeting of Shareholders, but are entitled to the economic benefits generally connected with the shares. The definition of subsidiaries, and therefore, treasury shares, for purposes of the above described reserves requirement and voting restrictions differs from the definition of subsidiaries for purposes of consolidation in our consolidated financial statements. The definition in the consolidated financial statements requires consolidation for financial reporting purposes of special purpose entities in instances where we have the power to govern the financial and operating policies of the entity so as to obtain benefits from its activities. Therefore, our consolidated financial statements include special purpose entities, mainly foundations, which do not qualify as subsidiaries subject to the reserve requirements and voting restrictions of the Swiss CO because we do not hold a majority participation in these special purpose entities. Accordingly, no reserve requirements apply to shares held by such special purpose entities, and such entities are not restricted from independently voting their shares.

Under the Swiss CO, we may not cancel treasury shares without the approval of a capital reduction by our shareholders.

(f) Not applicable.

(g) Since all of our issued and outstanding shares have been fully paid in, we can make no further capital calls on our shareholders.

(h) See "—Item 10.B.3(b) Shareholder rights" and "—Item 10.B.7 Change in control."

10.B.4 Changes to shareholder rights

Under the Swiss CO, we may not issue new shares without the prior approval of a capital increase by our shareholders. If a capital increase is approved, then our shareholders would generally have certain pre-emptive rights to obtain newly issued shares in an amount proportional to the nominal value of the shares they already hold. These pre-emptive rights could be modified in certain limited circumstances with the approval of a resolution adopted at a General Meeting of Shareholders by a supermajority of two-thirds of the votes. In addition, we may not create shares with increased voting powers or place restrictions on the transfer of registered shares without the approval of a resolution adopted at a General Meeting of Shareholders by a supermajority of votes. In addition, see "—Item 10.B.3(b) Shareholder rights" with regard to the Board's ability to cancel the registration of shares under limited circumstances.

10.B.5 Shareholder meetings

Under the Swiss CO and the Articles, we must hold an annual ordinary General Meeting of Shareholders within six months after the end of our financial year. General Meetings of Shareholders may be convened by the Board or, if necessary, by the statutory auditors. The Board is further required to convene an extraordinary General Meeting of Shareholders if so resolved by a General Meeting of Shareholders, or if so requested by shareholders holding an aggregate of at least 10% of the share capital, specifying the items for the agenda and their proposals. Shareholders holding shares with an aggregate nominal value of at least CHF 1 000 000 (i.e., 2 000 000 Novartis AG shares) or at least 10% of the share capital have the right to request that a specific proposal be put on the agenda and voted upon at

the next General Meeting of Shareholders. A General Meeting of Shareholders is convened by publishing a notice in the Swiss Official Gazette of Commerce (*Schweizerisches Handelsamtsblatt*) at least 20 days prior to such meeting. Shareholders may also be informed by mail. There is no provision in the Swiss CO or the Articles requiring a quorum for the holding of a General Meeting of Shareholders. In addition, see "—Item 10.B.3(b) Shareholder rights" regarding conditions for exercising a shareholder's right to vote at a General Meeting of Shareholders.

10.B.6 Limitations

There are no limitations under the Swiss CO or our Articles on the right of non-Swiss residents or nationals to own or vote shares other than the restrictions applicable to all shareholders. But see "Item 10.B.3(b) Share-

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holder rights" regarding conditions for exercising an ADR holder's right to vote at a shareholder meeting.

10.B.7 Change in control

The Articles and the Board Regulations contain no provision that would have an effect of delaying, deferring or preventing a change in control of Novartis AG and that would operate only with respect to a merger, acquisition or corporate restructuring involving us or any of our subsidiaries.

According to the Swiss Merger Act, shareholders may pass a resolution to merge with another corporation at any time. Such a resolution would require the consent of at least two-thirds of all votes present at the necessary General Meeting of Shareholders.

Under the Swiss Financial Market Infrastructure Act, shareholders and groups of shareholders acting in concert who acquire more than 33 1/3% of our shares would be under an obligation to make an offer to acquire all remaining Novartis AG shares. Novartis AG has neither opted out from the mandatory takeover offer obligation nor opted to increase the threshold for mandatory takeover offers in its Articles.

10.B.8 Disclosure of shareholdings

Under the Swiss Financial Market Infrastructure Act, persons who directly, indirectly or in concert with other parties acquire or dispose of our shares or purchase or sale rights relating to our shares are required to notify us and SIX of the level of their holdings whenever such holdings reach, exceed or fall below certain thresholds – 3%, 5%, 10%, 15%, 20%, 25%, 33 1/3%, 50% and 66 2/3% – of the voting rights represented by our share capital (whether exercisable or not). This also applies to anyone who has discretionary power to exercise voting rights associated with our shares. Following receipt of such notification, we are required to inform the public by publishing the information via the electronic publication platform operated by SIX.

An additional disclosure obligation exists under the Swiss CO that requires us to disclose, once a year in the notes to the financial statements published in our Annual Report, the identity of all of our shareholders (or related groups of shareholders) who have been granted exemption entitling them to vote more than 2% of our registered share capital, as described in "—Item 10.B.3(b) Shareholder rights."

10.B.9 Differences in the law

See the references to Swiss law throughout this "—Item 10.B Memorandum and articles of association."

10.B.10 Changes in capital

The requirements of the Articles regarding changes in capital are not more stringent than the requirements of Swiss law.

10.C Material contracts

Consumer Healthcare Joint Venture with GSK

On April 22, 2014 (and as amended from time to time), we entered into a Contribution Agreement with GSK under which GSK contributed its consumer healthcare business (the "GSK Consumer Healthcare Business") and we contributed our OTC Division, with certain limited exceptions that included the over-the-counter business of our Sandoz Division, into a newly created joint venture that operated under the GSK Consumer Healthcare name (the "Consumer Healthcare Joint Venture"). In consideration for those contributions, GSK owned 63.5% of the issued share capital of the Consumer Healthcare Joint Venture, and we owned 36.5% of the issued share capital of the Consumer Healthcare Joint Venture. We had the right, exercisable from March 2, 2018, to March 2, 2035, to require GSK to purchase our stake in the Consumer Healthcare Joint Venture.

On March 27, 2018, we entered into a Put Option Implementation Agreement with GSK and with the Consumer Healthcare Joint Venture. Under this agreement, we agreed to the cancellation of our shares in the Consumer Healthcare Joint Venture in consideration for a payment to us of USD 13 billion in cash. On May 3, 2018, GSK obtained the necessary shareholder approval, and the transaction was completed on June 1, 2018. Following cancellation of our shares, GSK acquired 100% control of the Consumer Healthcare Joint Venture.

Acquisition of AveXis

On April 9, 2018, we entered into an Agreement and Plan of Merger with AveXis, Inc. ("AveXis") to acquire AveXis for USD 218 per share or a total of approximately USD 8.7 billion in cash. Pursuant to the Merger Agreement, on April 17, 2018, we commenced a tender offer to acquire all outstanding shares of AveXis. We completed the

acquisition on May 15, 2018. As a result of the merger, AveXis became a wholly-owned subsidiary of Novartis AG.
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10.D Exchange controls

There are no Swiss governmental laws, decrees or regulations that restrict – in a manner material to Novartis AG – the export or import of capital, including any foreign exchange controls, or that generally affect the remittance of dividends or other payments to non-residents or non-citizens of Switzerland who hold Novartis AG shares.

10.E Taxation

The taxation discussion set forth below is intended only as a descriptive summary and does not purport to be a complete analysis or listing of all potential tax effects relevant to the ownership or disposition of our shares or ADRs. The statements of US and Swiss tax laws set forth below are based on the laws and regulations in force as of the date of this 20-F – including the current Convention Between the US and the Swiss Confederation for the Avoidance of Double Taxation with Respect to Taxes on Income, entered into force on December 19, 1997 (the Treaty); the US Internal Revenue Code of 1986, as amended (the Code); Treasury regulations; rulings; judicial decisions; and administrative pronouncements – and may be subject to any changes in US and Swiss law, and in any double taxation convention or treaty between the US and Switzerland occurring after that date, which changes may have retroactive effect.

Swiss taxation

Swiss residents

Withholding Tax on dividends and distributions. Dividends that we pay and similar cash or in-kind distributions that we may make to a holder of shares or ADRs (including distributions of liquidation proceeds in excess of the nominal value, stock dividends and, under certain circumstances, proceeds from repurchases of shares by us in excess of the nominal value) are generally subject to a Swiss federal withholding tax (the Withholding Tax) at a current rate of 35%. Under certain circumstances, distributions out of capital contribution reserves made by shareholders after December 31, 1996, are exempt from the Withholding Tax. We are required to withhold this Withholding Tax from the gross distribution and to pay the Withholding Tax to the Swiss Federal Tax Administration. The Withholding Tax is refundable in full to Swiss residents who are the beneficial owners of the taxable distribution at the time it is resolved and duly report the gross distribution received on their personal tax return or in their financial statements for tax purposes, as the case may be.

Income tax on dividends. A Swiss resident who receives dividends and similar distributions (including stock dividends and liquidation surplus) on shares or ADRs is required to include such amounts in the shareholder's personal income tax return. However, distributions out of qualified capital contribution reserves are not subject to income tax. A corporate shareholder may claim substantial relief from taxation of dividends and similar distributions received if the shares held represent a fair market value of at least CHF 1 million.

Capital gains tax upon disposal of shares. Under current Swiss tax law, the gain realized on shares held by a Swiss resident who holds shares or ADRs as part of his private property is generally not subject to any federal, cantonal or municipal income taxation on gains realized on the sale or other disposal of shares or ADRs. However, gains realized upon a repurchase of shares by us may be characterized as taxable dividend income if certain conditions are met. Book gains realized on shares or ADRs held by a Swiss corporate entity or by a Swiss resident individual as part of the shareholder's business property are, in general, included in the taxable income of such person. However, the Federal Law on the Direct Federal Tax of December 14, 1990, and several cantonal laws on direct cantonal taxes provide for exceptions for Swiss corporate entities holding more than 10% of our voting stock for more than one year.

Residents of other countries

Recipients of dividends and similar distributions on our shares who are neither residents of Switzerland for tax purposes nor holding shares as part of a business conducted through a permanent establishment situated in Switzerland (Non-Resident Holders) are not subject to Swiss income taxes in respect of such distributions. Moreover, gains realized by such recipients upon the disposal of shares are not subject to Swiss income taxes.

Non-Resident Holders of shares are, however, subject to the Withholding Tax on dividends and similar distributions mentioned above and, under certain circumstances, to the Stamp Duty described below. Such Non-Resident Holders may be entitled to a partial refund of the Withholding Tax if the country in which they reside has entered into a bilateral treaty for the avoidance of double taxation with Switzerland. Non-Resident Holders should be aware that the

procedures for claiming treaty refunds (and the timeframe required for obtaining a refund) may differ from country to country. Non-Resident Holders should consult their own tax advisors regarding receipt, ownership, purchase, sale or other dispositions of shares or ADRs, and the procedures for claiming a refund of the Withholding Tax.

As of January 1, 2019, Switzerland has entered into bilateral treaties for the avoidance of double taxation with respect to income taxes with the following countries, whereby a part of the above-mentioned Withholding Tax may be refunded (subject to the limitations set forth in such treaties):

Albania
Algeria
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahrain
Bangladesh
Belarus
Belgium
Bulgaria
Canada
Chile
China
Colombia
Croatia
Cyprus
Czech Republic
Denmark
Ecuador
Egypt
Estonia
Finland
France
Germany
Georgia
Ghana
Greece
Hong Kong
Hungary
Iceland
India
Indonesia
Iran
Israel
Italy
Ivory Coast
Republic of Ireland
Jamaica
Japan
Kazakhstan
Republic of Korea
(South Korea)
Kosovo
Kuwait
Kyrgyzstan
Latvia

Liechtenstein
Lithuania
Luxembourg
Macedonia
Malaysia
Malta
Mexico
Moldova
Mongolia
Montenegro
Morocco
Netherlands
New Zealand
Norway
Oman
Pakistan
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russia
Serbia
Singapore
Slovak Republic
Slovenia
South Africa
Spain
Sri Lanka
Sweden
Taiwan
Tajikistan
Thailand
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Ukraine
United Arab Emirates
United Kingdom
United States of America
Uruguay
Uzbekistan
Venezuela
Vietnam

The tax treaty with Bahrain is not applicable to the healthcare industry. Tax treaty negotiations are underway, or have been conducted, with Bosnia and Herzegovina, Brazil, Costa Rica, Ethiopia, Libya, North Korea, Saudi Arabia, Senegal, Syria, Zambia and Zimbabwe. Tax treaty negotiations between Switzerland and some of the countries listed in the immediately preceding sentence have been ongoing for an extended period of time, and we are not certain when or if such negotiations will be completed, and when or if the corresponding treaties will come into effect.

A Non-Resident Holder of shares or ADRs will not be liable for any Swiss taxes other than the Withholding Tax described above and, if the transfer occurs through or with a Swiss bank or other Swiss securities dealer, the Stamp Duty described below. If, however, the shares or ADRs of Non-Resident Holders can be attributed to a permanent establishment or a fixed place of business maintained by such person within Switzerland during the relevant tax year, the shares or ADRs may be subject to Swiss income taxes in respect of income and gains realized on the shares or ADRs, and such person may qualify for a full refund of the Withholding Tax based on Swiss tax law.

Residents of the US. A Non-Resident Holder who is a resident of the US for purposes of the Treaty is eligible for a reduced rate of tax on dividends equal to 15% of the dividend, provided that such holder (i) qualifies for benefits under the Treaty, (ii) holds, directly and indirectly, less than 10% of our voting stock, and (iii) does not conduct business through a permanent establishment or fixed base in Switzerland to which the shares or ADRs are attributable. Such an eligible holder must apply for a refund of the amount of the Withholding Tax in excess of the 15% Treaty rate. A Non-Resident Holder who is a resident of the US for purposes of the Treaty is eligible for a reduced rate of tax on dividends equal to 5% of the dividend, provided that such holder (i) is a company, (ii) qualifies for benefits under the Treaty, (iii) holds directly at least 10% of our voting stock, and (iv) does not conduct business through a permanent establishment or fixed place of business in Switzerland to which the shares or ADRs are attributable. Such an eligible holder must apply for a refund of the amount of the Withholding Tax in excess of the 5% Treaty rate. Claims for refunds must be filed on Swiss Tax Form 82 (82C for corporations; 82I for individuals; 82E for other entities), which may be obtained from any Swiss Consulate General in the US or from the Federal Tax Administration of Switzerland at the address below, together with an instruction form. Four copies of the form must be duly completed, signed before a notary public of the US, and sent to the Federal Tax Administration of Switzerland, Eigerstrasse 65, CH-3003 Bern, Switzerland. The form must be accompanied by suitable evidence of deduction of Swiss tax withheld at source, such as certificates of deduction, signed bank vouchers or credit slips. The form may be filed on or after July 1 or January 1 following the date the dividend was payable, but no later than December 31 of the third year following the calendar year in which the dividend became payable. For US resident holders of ADRs, JPMorgan Chase Bank, N.A., as depos-

itary, will comply with these Swiss procedures on behalf of the holders, and will remit the net amount to the holders.

Stamp Duty upon transfer of securities. The sale of shares, whether by Swiss residents or Non-Resident Holders, may be subject to federal securities transfer Stamp Duty of 0.15%, calculated on the sale proceeds, if the sale occurs through or with a Swiss bank or other Swiss securities dealer, as defined in the Swiss Federal Stamp Duty Act. The Stamp Duty has to be paid by the securities dealer and may be charged to the parties in a taxable transaction who are not securities dealers. Stamp Duty may also be due if a sale of shares occurs with or through a non-Swiss bank or securities dealer, provided (i) such bank or dealer is a member of the SIX, and (ii) the sale takes place on the SIX. In addition to this Stamp Duty, the sale of shares by or through a member of the SIX may be subject to a minor stock exchange levy.

US federal income taxation

The following is a general discussion of the material US federal income tax consequences of the ownership and disposition of our shares or ADRs that may be relevant to you if you are a US Holder (as defined below). Because this discussion does not consider any specific circumstances of any particular holder of our shares or ADRs, persons who are subject to US taxation are strongly urged to consult their own tax advisors as to the overall US federal, state and local tax consequences, as well as to the overall Swiss and other foreign tax consequences, of the ownership and disposition of our shares or ADRs. In particular, additional or different rules may apply to US expatriates; banks and other financial institutions; regulated investment companies; traders in securities who elect to apply a mark-to-market method of accounting; dealers in securities or currencies; tax-exempt entities; insurance companies; broker-dealers; investors liable for alternative minimum tax; investors that hold shares or ADRs as part of a straddle, hedging or conversion transaction; holders whose functional currency is not the US dollar; partnerships or other pass-through entities; persons who acquired our shares pursuant to the exercise of employee stock options or otherwise as compensation; and persons who hold, directly, indirectly or by attribution, 10% or more of our outstanding shares. This discussion generally applies only to US Holders who hold the shares or ADRs as a capital asset (generally, for investment purposes), and whose functional currency is the US dollar. Investors are urged to consult their own tax advisors concerning whether they are eligible for benefits under the Treaty.

For purposes of this discussion, a US Holder is a beneficial owner of our shares or ADRs who is (i) an individual who is a citizen or resident of the US for US federal income tax purposes; (ii) a corporation (or other entity taxable as a corporation for US federal income tax purposes) created or organized in or under the laws of the US or a state thereof or the District of Columbia; (iii) an estate the income of which is subject to US federal income taxation regardless of its source; or (iv) a trust (i) subject to the primary supervision of a US court and the control of one or more US persons, or (ii) that has a valid election in place to be treated as a US person. If a partnership (or other entity treated as a partnership for US federal income tax purposes) holds shares or ADRs, the tax treatment of a partner generally will depend upon the status of the partner and the activities of the partnership. Partners in a partnership that holds shares or ADRs are urged to consult their own tax advisor regarding the specific tax consequences of the owning and disposing of such shares or ADRs by the partnership.

For US federal income tax purposes, a US Holder of ADRs generally will be treated as the beneficial owner of our shares represented by the ADRs. However, see the discussion below under "—Dividends" regarding certain statements made by the US Treasury concerning depositary arrangements.

This discussion assumes that each obligation in the Deposit Agreement and any related agreement will be performed in accordance with its terms.

Dividends. US Holders will be required to include in gross income, as an item of ordinary income, the full amount (including the amount of any Withholding Tax) of a dividend paid with respect to our shares or ADRs at the time that such dividend is received by the US Holder, in the case of shares, or by the depositary, in the case of ADRs. For this purpose, a "dividend" will include any distribution paid by us with respect to our shares or ADRs (other than certain pro rata distributions of our capital stock) paid out of our current or accumulated earnings and profits, as determined under US federal income tax principles. To the extent the amount of a distribution by us exceeds our current and accumulated earnings and profits, such excess will first be treated as a tax-free return of capital to the extent of a US Holder's tax basis in the shares or ADRs (with a corresponding reduction in such tax basis), and thereafter will be treated as capital gain, which will be long-term capital gain if the US Holder held our shares or ADRs for more than one year. Under the Code, dividend payments by us on the shares or ADRs are not eligible for the dividends received deduction generally allowed to corporate shareholders.

Dividend income in respect of our shares or ADRs will constitute income from sources outside the US for US foreign tax credit purposes. Subject to the limitations and conditions provided in the Code, US Holders generally may claim as a credit against their US federal income tax liability, any Withholding Tax withheld from a dividend. The rules governing the foreign tax credit are complex. Each US Holder is urged to consult its own tax advisor concerning whether, and to what extent, a foreign tax credit will be available with respect to dividends received from us. Alternatively, a US Holder may claim the Withholding Tax as a deduction for the taxable year within which the Withholding Tax is paid or accrued, provided a deduction is claimed for all of the foreign income taxes the US Holder pays or accrues in the particular year. A deduction does not reduce US tax on a dollar-for-dollar basis like a tax credit. The deduction, however, is not subject to the limitations applicable to foreign tax credits, but may be subject to other limitations, and each US Holder is urged to consult its own tax advisor.

The US Treasury has expressed concern that parties to whom ADRs are released may be taking actions inconsistent with the claiming of foreign tax credits for US Holders of ADRs. Accordingly, the summary above of the creditability of the Withholding Tax could be affected by future actions that may be taken by the US Treasury.

In general, a US Holder will be required to determine the amount of any dividend paid in Swiss francs, including the amount of any Withholding Tax imposed thereon, by translating the Swiss francs into US dollars at the spot rate on the date the dividend is actually or constructively received by a US Holder, in the case of shares, or by the depositary, in the case of ADRs, regardless of whether the Swiss francs are in fact converted into US dollars. If a US Holder converts the Swiss francs so received into US dollars on the date of receipt, the US Holder generally should not recognize foreign currency gain or loss on such conversion. If a US Holder does not convert the Swiss francs so received into US dollars on the date of receipt, the US Holder will have a tax basis in the Swiss francs equal to the US dollar value on such date. Any foreign currency gain or loss that a US Holder recognizes on a subsequent conversion or other disposition of the Swiss francs generally will be treated as US source ordinary income or loss.

For a non-corporate US Holder, the US dollar amount of any dividends paid that constitute qualified dividend income generally will be taxable at a maximum rate of 15% (or 20% in the case of taxpayers with annual income that exceeds certain thresholds), provided that the US Holder meets certain holding period and other requirements. In addition, the dividends could be subject to a 3.8% net investment income tax. This tax is applied against the lesser of the US Holder's net investment income or the amount by which modified adjusted gross income exceeds a statutory threshold amount based on filing status. We currently believe that dividends paid with respect to our shares and ADRs will constitute qualified dividend income for US federal income tax purposes. US Holders of shares or ADRs are urged to consult their own tax advisors regarding the availability to them of the reduced dividend rate in light of their own particular situation and the computations of their foreign tax credit limitation with respect to any qualified dividends paid to them, as applicable.

Sale or other taxable disposition. Upon a sale or other taxable disposition of shares or ADRs, US Holders generally will recognize capital gain or loss in an amount equal to the difference between the US dollar value of the amount realized on the disposition and the US Holder's tax basis (determined in US dollars) in the shares or ADRs. This capital gain or loss generally will be US source gain or loss and will be treated as long-term capital gain or loss if the holding period in the shares or ADRs exceeds one year. In the case of a non-corporate US Holder, any long-term capital gain generally will be subject to US federal income tax at preferential rates, with a maximum rate of 15% (or 20% in the case of taxpayers with annual income that exceeds certain thresholds). In addition, the gains could be subject to a 3.8% investment income tax. This tax is applied against the lesser of the US Holder's net investment income or the amount by which modified adjusted gross income exceeds a statutory threshold amount based on filing status. The deductibility of capital losses is subject to significant limitations under the Code. Deposits or withdrawals of our shares by US Holders in exchanges for ADRs will not result in the realization of gain or loss for US federal income tax purposes.

US information reporting and backup withholding. Dividend payments with respect to shares or ADRs and proceeds from the sale, exchange or other disposition of shares or ADRs received in the United States or through US-related financial intermediaries may be subject to information reporting to the US Internal Revenue Service (IRS) and possible US backup withholding. Certain exempt recipients (such as corporations) are not subject to these information reporting and backup withholding requirements. Backup withholding will not apply to a US Holder who furnishes a correct taxpayer identification number and makes any other required certification or who is otherwise exempt from backup withholding. Any US Holders required to establish their exempt status generally must provide a properly executed IRS Form W-9 (Request for Taxpayer Identification Number and Certification). Backup withholding is not an additional tax. Amounts withheld as backup withholding may be credited against a US Holder's US federal income tax liability, and a US Holder may obtain a refund of any excess amounts withheld under the backup withholding rules by timely filing the appropriate claim for refund with the IRS and furnishing any required information.

10.F Dividends and paying agents

Not applicable.

10.G Statement by experts

Not applicable.

10.H Documents on display

Any statement in this Form 20-F about any of our contracts or other documents is not necessarily complete. If the contract or document is filed as an exhibit to the Form 20-F, the contract or document is deemed to modify the description contained in this Form 20-F. You must review the exhibits themselves for a complete description of the contract or document.

The SEC maintains an internet site at http://www.sec.gov that contains reports and other information regarding issuers that file electronically with the SEC. These SEC filings are also available to the public from commercial document retrieval services.

We are required to file or furnish reports and other information with the SEC under the Securities Exchange Act of 1934 and regulations under that act. As a foreign private issuer, we are exempt from the rules under the Exchange Act prescribing the form and content of proxy statements, and our officers, directors and principal shareholders are exempt from the reporting and short swing profit recovery provisions contained in Section 16 of the Exchange Act.

10.I Subsidiary information

Not applicable.

Item 11. Quantitative and Qualitative Disclosures About Market Risk

The major financial risks facing the Group are managed centrally by Group Treasury. We have a written Treasury Directive and have implemented a strict segregation of front-office and back-office controls. The Group does regular reconciliations of its positions with its counterparties. In addition, the Treasury function is included in management's internal control assessment.

For information about the effects of currency fluctuations and how we manage currency risk, see "Item 5. Operating and Financial Review and Prospects—Item 5.B Liquidity and capital resources."

The information set forth under "Item 18. Financial Statements—Note 28. Financial instruments—additional disclosures" is incorporated by reference.

Item 12. Description of Securities Other Than Equity Securities

12.A Debt securities

Not applicable.

12.B Warrants and rights

Not applicable.

12.C Other securities

Not applicable.

12.D American Depositary Shares

Fees payable by ADR holders

According to our Deposit Agreement with the ADS depositary, JPMorgan Chase Bank, N.A. (JPMorgan), holders of our ADRs may have to pay to JPMorgan, either directly or indirectly, fees or charges up to the amounts set forth below:

Category	Depositary actions	Associated fee
Depositing or substituting underlying shares	Acceptance of shares surrendered, and issuance of ADRs in exchange, including surrenders and issuances in respect of: — Share distributions — Stock split — Rights — Merger — Exchange of shares or any other transaction or event or other distribution affecting the ADSs or the deposited shares	USD 5.00 for each 100 ADSs (or portion thereof) evidenced by the new ADRs delivered
Withdrawing underlying shares	Acceptance of ADRs surrendered for withdrawal of deposited shares	USD 5.00 for each 100 ADSs (or portion thereof) evidenced by the ADRs surrendered
Selling or exercising rights	Distribution or sale of shares, the fee being in an amount equal to the fee for the execution and delivery of ADRs that would have been charged as a result of the deposit of such shares	USD 5.00 for each 100 ADSs (or portion thereof)
Transferring, splitting or grouping receipts	Transfers, combining or grouping of depositary receipts	USD 1.50 per ADR
Expenses of the depositary	Expenses incurred on behalf of holders in connection with: — Compliance with foreign exchange control regulations or any law or regulation relating to foreign investment — The depositary's or its custodian's compliance with applicable	Expenses payable at the sole discretion of the depositary by billing holders or by deducting charges from

	law, rule or regulation — Stock transfer or other taxes and other governmental charges — Cable, telex and facsimile transmission and delivery — Expenses of the depositary in connection with the conversion of foreign currency into US dollars (which are paid out of such foreign currency) — Any other charge payable by any of the depositary or its agents	one or more cash dividends or other cash distributions
Advance tax relief 217	Tax relief/reclamation process for qualified holders	A depositary service charge of USD 0.008 per ADS

Fees payable by the depositary to the issuer

Pursuant to an agreement effective as of May 11, 2017 (the Agreement), JPMorgan, as our ADS depositary, has agreed to make an annual contribution payment to Novartis at the end of each 12-month period beginning on the effective date of the Agreement and on each subsequent anniversary of the effective date of the Agreement (each such 12-month period is a "Contract Year"). This annual contribution payment will equal: (a)(1) USD 1.7 million less (a)(2) the custody costs, fees and expenses (including, without limitation, any central securities depository fees, charges and expenses) incurred during the applicable Contract Year (the items in (a)(2) collectively are the "Custody Costs") plus (b) 70% of the gross issuance and cancellation fees collected by JPMorgan under the Deposit Agreement during such Contract Year minus (c) that portion (if any) of JPMorgan's legal fees, charges and out-of-pocket expenses in excess of USD 50 000 for such Contract Year. To the extent that the Custody Costs for a Contract Year exceed USD 1.7 million, these costs would be capped at USD 1.7 million.

JPMorgan has further agreed to waive the USD 0.05 per ADS issuance fees that would normally be owed by Novartis in connection with our deposits of shares as part of our employee stock ownership and employee participation plans. Novartis is responsible for reimbursing JPMorgan for all taxes and governmental charges required to have been withheld and/or paid, and not so withheld and/or paid, arising from such waived fees.

PART II

Item 13. Defaults, Dividend Arrearages and Delinquencies

None.

Item 14. Material Modifications to the Rights of Security Holders and Use of Proceeds

None.

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Item 15. Controls and Procedures

(a) Novartis AG's Chief Executive Officer and Chief Financial Officer, after evaluating the effectiveness of our disclosure controls and procedures (as defined in Exchange Act Rule 13a-15(e)) as of the end of the period covered by this Annual Report, have concluded that, as of such date, our disclosure controls and procedures were effective.
(b) Report of Novartis Management on Internal Control Over Financial Reporting: The Board of Directors and management of the Group are responsible for establishing and maintaining adequate internal control over financial reporting. The Group's internal control over financial reporting was designed to provide reasonable assurance to the Group's management and Board of Directors regarding the reliability of financial reporting and the preparation and fair presentation of its published consolidated financial statements.
Internal controls over financial reporting, no matter how well designed, have inherent limitations. Therefore, even those internal controls over financial reporting determined to be effective may not prevent or detect misstatements and can provide only reasonable assurance with respect to financial statement preparation and presentation. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.
Group management assessed the effectiveness of the Group's internal control over financial reporting as of December 31, 2018. In making this assessment, it used the criteria established in *Internal Control—Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on our assessment, management concluded that, as of December 31, 2018, the Group's internal control over financial reporting is effective based on those criteria.
PricewaterhouseCoopers AG, Switzerland, an independent registered public accounting firm, has issued an unqualified opinion on the effectiveness of the Group's internal control over financial reporting, which is included in this Annual Report under "Item 18. Financial Statements—Report of independent registered public accounting firm."
(c) See the report of PwC, an independent registered public accounting firm, included under "Item 18. Financial Statements—Report of independent registered public accounting firm."
(d) There were no changes to our internal control over financial reporting that occurred during the period covered by this Annual Report that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Item 16A. Audit Committee Financial Expert

Our Audit and Compliance Committee has determined that Srikant Datar and Elizabeth Doherty each possess specific accounting and financial management expertise and that each is an Audit Committee Financial Expert as defined by the US Securities and Exchange Commission (SEC). The Board of Directors has also determined that Srikant Datar and Elizabeth Doherty are each “independent” in accordance with the applicable requirements of Rule 10A-3 of the US Securities Exchange Act of 1934, and that other members of the Audit and Compliance Committee have sufficient experience and ability in finance and compliance matters to enable them to adequately discharge their responsibilities.

Item 16B. Code of Ethics

In addition to our Code of Conduct and Professional Practices Policy, which are applicable to all of our associates, we have adopted Ethical Conduct Requirements that impose additional obligations on our principal executive officer, principal financial officer, principal accounting officer, and persons performing similar functions. This document is accessible on our internet website at:
https://www.novartis.com/investors/company-overview/corporate-governance
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Item 16C. Principal Accountant Fees and Services

The information set forth under “Item 6. Directors, Senior Management and Employees—Item 6.C Board practices—Corporate governance—Our independent external auditors” is incorporated by reference.

Item 16D. Exemptions from the Listing Standards for Audit Committees

Not applicable.

Item 16E. Purchases of Equity Securities by the Issuer and Affiliated Purchasers

2018	Total Number of Shares Purchased (a) [1]	Average price paid per share in USD (b)	Total number of shares purchased as part of publicly announced plans or programs (c) [2]	Maximum approximate value of shares that may yet be purchased under the plans or programs (CHF millions) (d)	Maximum approximate value of shares that may yet be purchased under the plans or programs (USD millions) (e) [3]
Jan. 1-31	861 113	86.92	0	4 045	4 340
Feb. 1-28	81 918	86.68	0	4 045	4 300
Mar. 1-31	62 593	82.64	0	4 045	4 227
Apr. 1-30	1 035 141	77.12	1 000 000	3 970	4 018
May 1-31	4 060 146	76.92	4 000 000	3 663	3 705
Jun. 1-30	4 219 696	74.93	4 200 000	3 351	3 369
Jul. 1-31	5 535 887	80.44	5 520 000	2 910	2 947
Aug. 1-31	3 503 739	83.29	3 480 000	2 623	2 711
Sep. 1-30	3 010 401	84.20	2 980 000	2 380	2 437
Oct. 1-31	1 391 780	84.63	1 370 000	2 265	2 254
Nov. 1-30	18 012	86.61	0	2 265	2 274
Dec. 1-31	716 316	84.81	700 000	2 207	2 237
Total	24 496 742	80.26	23 250 000		

[1] Column (a) shows shares we purchased as part of our seventh share repurchase program plus the following types of share purchases outside of our publicly announced repurchase program: (1) shares which we purchased on the open market; and (2) shares which we purchased from employees who had obtained the shares through a Novartis Employee Ownership Plan. See "Item 18. Financial Statements - Note 25 Equity-based participation plans for associates."

[2] Column (c) shows shares purchased as part of our seventh share repurchase program which was approved by the shareholders February 23, 2016 for an amount of up to CHF 10.0 billion. See "Item 6. Directors, Senior Management and Employees - Item 6C. Board Practices - Our capital structure - Changes in capital."

[3] Column (e) shows the Swiss franc amount from column (d) converted into US dollars as of the month-end, using the Swiss franc/US dollar exchange rate at the applicable month-end.

Item 16F. Change in Registrant’s Certifying Accountant

Not applicable.

Item 16G. Corporate Governance

The information set forth under “Item 6. Directors, Senior Management and Employees—Item 6.C Board practices—Corporate governance—Our corporate governance framework” is incorporated by reference.

Item 16H. Mine Safety Disclosure

Not applicable.

PART III

Item 17. Financial Statements

See response to “Item 18. Financial Statements.”

Item 18. Financial Statements

The following financial statements are filed as part of this Annual Report.

Item 19. Exhibits

The SEC maintains an internet site at http://www.sec.gov that contains reports and other information regarding issuers that file electronically with the SEC. These SEC filings are also available to the public from commercial document retrieval services.

1.1 Articles of Incorporation of Novartis AG, as amended March 2, 2018 (English translation).

1.2 Regulations of the Board of Directors, its Committees and the Executive Committee of Novartis AG, as amended in relevant part January 1, 2014, March 1, 2015, January 1, 2018, and January 21, 2019.

2.1 Amended and Restated Deposit Agreement, dated as of May 11, 2000, among Novartis AG, JPMorgan Chase Bank (fka Morgan Guaranty Trust Company of New York), as depositary, and all holders from time to time of ADRs issued thereunder (incorporated by reference to Exhibit (a)(1) to Post-Effective Amendment No. 1 to Novartis AG's registration statement on Form F-6 (File No. 333-11758) as filed with the SEC on September 8, 2000).

2.2 Amendment No. 1 to the Amended and Restated Deposit Agreement (incorporated by reference to Exhibit (a)(2) to Post-Effective Amendment No. 1 to Novartis AG's registration statement on Form F-6 (File No. 333-11758) as filed with the SEC on September 8, 2000).

2.3 Amendment No. 2 to the Amended and Restated Deposit Agreement (incorporated by reference to Exhibit (a)(3) to Novartis AG's registration statement on Form F-6 (File No. 333-13446) as filed with the SEC on May 3, 2001).

2.4 Restricted Issuance Agreement dated as of January 11, 2002, among Novartis AG, J.P. Morgan Chase Bank, as depositary, and all holders from time to time of ADRs representing ADSs issued thereunder (incorporated by reference to Exhibit 4 to the Registration Statement on Form F-3, File No. 333-81862, as filed with the SEC on January 31, 2002).

2.5 Letter Agreement dated December 14, 2007, between Novartis AG and JPMorgan Chase Bank, as depositary (incorporated by reference to Exhibit 2.4 to the Form 20-F for the year ended December 31, 2007, as filed with the SEC on January 28, 2008).

2.6 Form of American Depositary Receipt (incorporated by reference to Exhibit (a)(7) to the Registration Statement on Form F-6, File No. 333-198623, as filed with the SEC on September 8, 2014).

2.7 The total amount of long-term debt securities authorized under any instrument does not exceed 10% of the total assets of the Company and its subsidiaries on a consolidated basis. We hereby agree to furnish to the SEC, upon its request, a copy of any instrument defining the rights of holders of long-term debt of the Company or of its subsidiaries for which consolidated or unconsolidated financial statements are required to be filed.

4.1 Put Option Implementation Agreement relating to the cancellation of our shares in GlaxoSmithKline Consumer Healthcare Holdings Limited made on March 27, 2018, between GlaxoSmithKline PLC, Setfirst Limited, Novartis AG, Novartis Holding AG, Novartis Finance Corporation and GlaxoSmithKline Consumer Healthcare Holdings Limited.

4.2 Agreement and Plan of Merger dated as of April 6, 2018, among Novartis AG, Novartis AM Merger Corporation and Avexis, Inc. (incorporated by reference to Exhibit 2.1 to the Current Report on Form 8-K of AveXis, Inc. as filed with the SEC on April 9, 2018).

8.1 For a list of all of our principal Group subsidiaries and associated companies, see "Item 18. Financial Statements—Note 31. Principal Group subsidiaries and associated companies."

12.1 Certification of Vasant Narasimhan, Chief Executive Officer of Novartis AG, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
12.2 Certification of Harry Kirsch, Chief Financial Officer of Novartis AG, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
13.1 Certification of Vasant Narasimhan, Chief Executive Officer of Novartis AG, pursuant to Section 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
13.2 Certification of Harry Kirsch, Chief Financial Officer of Novartis AG, pursuant to Section 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
15.1 Consent of PricewaterhouseCoopers AG.
101.INS XBRL Instance Document
101.SCH XBRL Taxonomy Extension Schema Document
101.CAL XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF XBRL Taxonomy Extension Definition Linkbase Document
101.LAB XBRL Taxonomy Extension Label Linkbase Document
101.PRE XBRL Taxonomy Extension Presentation Linkbase Document
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SIGNATURES

The registrant hereby certifies that it meets all of the requirements for filing on Form 20-F and that it has duly caused and authorized the undersigned to sign this Annual Report on its behalf.

Novartis AG
By: /s/ Harry Kirsch
Name: Harry Kirsch
Title: *Chief Financial Officer, Novartis Group*
By: /s/ Shannon Thyme Klinger
Name: Shannon Thyme Klinger
Title: *General Counsel, Novartis Group*
Date: January 30, 2019

Novartis Group consolidated financial statements

Consolidated income statements
(For the years ended December 31, 2018, 2017 and 2016)

(USD millions unless indicated otherwise)	Note	2018	2017	2016
Net sales to third parties	3	51 900	49 109	48 518
Other revenues	3	1 266	1 026	918
Cost of goods sold		– 18 407	– 17 175	– 17 520
Gross profit		34 759	32 960	31 916
Selling, general and administration		– 16 471	– 14 997	– 14 192
Research and development		– 9 074	– 8 972	– 9 039
Other income		1 690	1 969	1 927
Other expense		– 2 735	– 2 331	– 2 344
Operating income		8 169	8 629	8 268
Income from associated companies	4	6 438	1 108	703
Interest expense	5	– 957	– 777	– 707
Other financial income and expense	5	185	39	– 447
Income before taxes		13 835	8 999	7 817
Taxes	6	– 1 221	– 1 296	– 1 119
Net income		12 614	7 703	6 698
Attributable to:				
Shareholders of Novartis AG		12 611	7 703	6 712
Non-controlling interests		3	0	– 14
Basic earnings per share (USD)	7	5.44	3.28	2.82
Diluted earnings per share (USD)	7	5.38	3.25	2.80

The accompanying Notes form an integral part of the consolidated financial statements.

Consolidated statements of comprehensive income
(For the years ended December 31, 2018, 2017 and 2016)

(USD millions)	Note	2018	2017	2016
Net income		12 614	7 703	6 698
Other comprehensive income to be eventually recycled into the consolidated income statement:				
Fair value adjustments on marketable securities, net of taxes	8.1		39	– 113
Fair value adjustments on debt securities, net of taxes	8.1		– 1	
Fair value adjustments on deferred cash flow hedges, net of taxes	8.1	12	12	15
Total fair value adjustments on financial instruments, net of taxes		12	50	– 98
Novartis share of other comprehensive income recognized by associated companies, net of taxes	4	– 482	– 37	671
Net investment hedge	8	95	– 237	
Currency translation effects	8.2	315	2 210	– 2 391
Total of items to eventually recycle		– 60	1 986	– 1 818
Other comprehensive income never to be recycled into the consolidated income statement:				
Actuarial (losses)/gains from defined benefit plans, net of taxes	8.3	– 359	851	– 515
Fair value adjustments on equity securities, net of taxes	8.1	13		
Total of items never to be recycled		– 346	851	– 515
Total comprehensive income		12 208	10 540	4 365
Attributable to:				
Shareholders of Novartis AG		12 210	10 538	4 382
Non-controlling interests		– 2	2	– 17

The accompanying Notes form an integral part of the consolidated financial statements.
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Consolidated balance sheets
(At December 31, 2018 and 2017)

(USD millions)	Note	2018	2017
Assets			
Non-current assets			
Property, plant and equipment	9	15 696	16 464
Goodwill	10	35 294	31 750
Intangible assets other than goodwill	10	38 719	29 997
Investments in associated companies	4	8 352	15 370
Deferred tax assets	11	8 699	8 229
Financial assets	12	2 345	2 243
Other non-current assets	12	895	818
Total non-current assets		110 000	104 871
Current assets			
Inventories	13	6 956	6 867
Trade receivables	14	8 727	8 600
Income tax receivables		248	202
Marketable securities, commodities, time deposits and derivative financial instruments	15	2 693	625
Cash and cash equivalents	15	13 271	8 860
Other current assets	16	2 861	3 054
Total current assets without disposal group		34 756	28 208
Assets of disposal group held for sale	2	807	
Total current assets		35 563	28 208
Total assets		145 563	133 079
Equity and liabilities			
Equity			
Share capital	17	944	969
Treasury shares	17	– 69	– 100
Reserves		77 739	73 299
Issued share capital and reserves attributable to Novartis AG shareholders		78 614	74 168
Non-controlling interests		78	59
Total equity		78 692	74 227
Liabilities			
Non-current liabilities			
Financial debts	18	22 470	23 224
Deferred tax liabilities	11	7 475	5 168
Provisions and other non-current liabilities	19	7 319	7 057
Total non-current liabilities		37 264	35 449
Current liabilities			
Trade payables		5 556	5 169
Financial debts and derivative financial instruments	20	9 678	5 308
Current income tax liabilities		2 038	1 723
Provisions and other current liabilities	21	12 284	11 203
Total current liabilities without disposal group		29 556	23 403
Liabilities of disposal group held for sale	2	51	
Total current liabilities		29 607	23 403
Total liabilities		66 871	58 852
Total equity and liabilities		145 563	133 079

The accompanying Notes form an integral part of the consolidated financial statements.

Consolidated statements of changes in equity
(For the years ended December 31, 2018, 2017 and 2016)

(USD millions)	Note	Share capital	Treasury shares	Retained earnings	Total value adjustments	Issued share capital and reserves attributable to Novartis shareholders	Non-controlling interests	Total equity
Total equity at January 1, 2016		991	– 101	80 379	– 4 223	77 046	76	77 122
Net income				6 712		6 712	– 14	6 698
Other comprehensive income	8			671	– 3 001	– 2 330	– 3	– 2 333
Total comprehensive income				7 383	– 3 001	4 382	– 17	4 365
Dividends	17.1			– 6 475		– 6 475		– 6 475
Purchase of treasury shares	17.2		– 7	– 985		– 992		– 992
Reduction of share capital	17	– 19	25	– 6				
Exercise of options and employee transactions	17.2		2	212		214		214
Equity-based compensation	17.2		5	659		664		664
Impact of change in ownership of consolidated entities	17.5			– 7		– 7		– 7
Fair value adjustments related to divestments	8			– 12	12			
Total of other equity movements		– 19	25	– 6 614	12	– 6 596		– 6 596
Total equity at December 31, 2016		972	– 76	81 148	– 7 212	74 832	59	74 891
Net income				7 703		7 703		7 703
Other comprehensive income	8			– 37	2 872	2 835	2	2 837
Total comprehensive income				7 666	2 872	10 538	2	10 540
Dividends	17.1			– 6 495		– 6 495		– 6 495
Purchase of treasury shares	17.2		– 36	– 5 538		– 5 574		– 5 574
Reduction of share capital	17	– 3	5	– 2				
Exercise of options and employee transactions	17.2		2	253		255		255
Equity-based compensation	17.2		5	607		612		612
Changes in non-controlling interests	17.6						– 2	– 2
Total of other equity movements		– 3	– 24	– 11 175		– 11 202	– 2	– 11 204
Total equity at December 31, 2017, as previously reported		969	– 100	77 639	– 4 340	74 168	59	74 227
Impact of change in accounting policies	1, 29			237	– 177	60		60
		969	– 100	77 876	– 4 517	74 228	59	74 287

Restated equity at January 1, 2018								
Net income				12 611		12 611	3	12 614
Other comprehensive income	8			– 482	81	– 401	– 5	– 406
Total comprehensive income				12 129	81	12 210	– 2	12 208
Dividends	17.1			– 6 966		– 6 966		– 6 966
Purchase of treasury shares	17.2		– 13	– 1 960		– 1 973		– 1 973
Reduction of share capital	17	– 25	34	– 9				
Exercise of options and employee transactions	17.2		4	430		434		434
Other share sales	17.2		2	261		263		263
Equity-based compensation	17.2		4	752		756		756
Increase of treasury share repurchase obligation under a share buyback trading plan	17.3			– 284		– 284		– 284
Transaction costs	17.4			– 79		– 79		– 79
Fair value adjustments on financial assets sold	8			16	– 16			
Impact of change in ownership of consolidated entities	17.5			– 13		– 13	22	9
Changes in non-controlling interests	17.6						– 1	– 1
Other movements	17.7			38		38		38
Total of other equity movements		– 25	31	– 7 814	– 16	– 7 824	21	– 7 803
Total equity at December 31, 2018		944	– 69	82 191	– 4 452	78 614	78	78 692

The accompanying Notes form an integral part of the consolidated financial statements.

Consolidated statements of cash flows
(For the years ended December 31, 2018, 2017 and 2016)

(USD millions)	Note	2018	2017	2016
Net income		12 614	7 703	6 698
Adjustments to reconcile net income to net cash flows from operating activities				
Reversal of non-cash items and other adjustments	22.1	3 171	7 058	8 437
Dividends received from associated companies and others		719	987	899
Interest received		243	97	43
Interest paid		– 826	– 708	– 723
Other financial receipts		218		
Other financial payments		– 32	– 272	– 155
Taxes paid [1]		– 1 670	– 1 611	– 2 111
Net cash flows from operating activities before working capital and provision changes		14 437	13 254	13 088
Payments out of provisions and other net cash movements in non-current liabilities		– 664	– 877	– 1 536
Change in net current assets and other operating cash flow items	22.2	499	244	– 77
Net cash flows from operating activities		14 272	12 621	11 475
Purchase of property, plant and equipment		– 1 773	– 1 696	– 1 862
Proceeds from sales of property, plant and equipment		102	92	161
Purchase of intangible assets		– 1 582	– 1 050	– 1 017
Proceeds from sales of intangible assets		823	640	847
Purchase of financial assets		– 262	– 468	– 247
Proceeds from sales of financial assets		167	330	247
Purchase of other non-current assets		– 39	– 42	– 149
Proceeds from sales of other non-current assets		9	1	
Divestments and acquisitions of interests in associated companies, net [1]	22.3	12 854	29	
Acquisitions and divestments of businesses, net	22.4	– 13 922	– 784	– 765
Purchase of marketable securities and commodities		– 2 440	– 580	– 530
Proceeds from sales of marketable securities and commodities		472	549	622
Net cash flows used in investing activities from continuing operations		– 5 591	– 2 979	– 2 693
Net cash flows used in investing activities from discontinued operations [1]	22.5		– 140	– 748
Total net cash flows used in investing activities		– 5 591	– 3 119	– 3 441
Dividends paid to shareholders of Novartis AG		– 6 966	– 6 495	– 6 475
Acquisition of treasury shares		– 2 036	– 5 490	– 1 109
Proceeds from exercise options and other treasury share transactions		700	252	214
Increase in non-current financial debts	22.6	2 856	4 933	1 935
Repayment of non-current financial debts	22.6	– 366	– 188	– 1 696
Change in current financial debts	22.6	1 681	– 755	1 816
Impact of change in ownership of consolidated entities		– 19	0	– 6
Transaction costs payments [2]		– 57		
Dividends paid to non-controlling interests and other financing cash flows		– 37	10	7
Net cash flows used in financing activities		– 4 244	– 7 733	– 5 314
Effect of exchange rate changes on cash and cash equivalents		– 26	84	– 387
Net change in cash and cash equivalents		4 411	1 853	2 333
Cash and cash equivalents at January 1		8 860	7 007	4 674
Cash and cash equivalents at December 31		13 271	8 860	7 007

The accompanying Notes form an integral part of the consolidated financial statements.

[1] In 2018, the total net tax payment amounted to USD 1 809 million, of which USD 139 million is included in the line "Divestments and acquisitions of interests in associated companies, net." In 2016, the total net tax payment amounted to USD 2 299 million, of which USD 188 million was included in the cash flows used in investing activities from discontinued operations.

[2] Transaction costs payments directly attributable to the pending transaction of the distribution (spin-off) of the Alcon Division to Novartis AG shareholders (see Note 1)

Notes to the Novartis Group consolidated financial statements

1. Significant accounting policies

The Novartis Group (Novartis or Group) is a multinational group of companies specializing in the research, development, manufacturing and marketing of a broad range of healthcare products led by innovative pharmaceuticals and also including cost-saving generic pharmaceuticals and eye care products. The Group is headquartered in Basel, Switzerland.

The consolidated financial statements of the Group are prepared in accordance with International Financial Reporting Standards (IFRS) as issued by the International Accounting Standards Board (IASB). They are prepared in accordance with the historical cost convention except for items that are required to be accounted for at fair value.

The Group's financial year-end is December 31, which is also the annual closing date of the individual entities' financial statements incorporated into the Group's consolidated financial statements.

The preparation of financial statements requires management to make certain estimates and assumptions, either at the balance sheet date or during the year, which affect the reported amounts of assets and liabilities, including any contingent amounts, as well as of revenues and expenses. Actual outcomes and results could differ from those estimates and assumptions.

Listed below are accounting policies of significance to Novartis or, in cases where IFRS provides alternatives, the option adopted by Novartis.

Scope of consolidation

The consolidated financial statements include all entities, including structured entities, over which Novartis AG, Basel, Switzerland, directly or indirectly has control (generally as a result of owning more than 50% of the entity's voting interest). Consolidated entities are also referred to as "subsidiaries."

In cases where Novartis does not fully own a subsidiary, it has elected to value any remaining outstanding non-controlling interest at the time of acquiring control of the subsidiary at its proportionate share of the fair value of the net identified assets.

The contribution of a business to an associate or joint venture is accounted for by applying the option under IFRS that permits the accounting for the retained interest of the business contributed at its net book value at the time of the contribution.

Investments in associated companies (generally defined as investments in entities in which Novartis holds between 20% and 50% of voting shares or over which it otherwise has significant influence) and joint ventures are accounted for using the equity method, except for selected venture fund investments for which the Group has elected to apply the method of fair value through the consolidated income statement.

Foreign currencies

The consolidated financial statements of Novartis are presented in US dollars (USD). The functional currency of subsidiaries is generally the local currency of the respective entity. The functional currency used for the reporting of certain Swiss and foreign finance entities is USD instead of their respective local currencies. This reflects the fact that the cash flows and transactions of these entities are primarily denominated in these currencies.

For subsidiaries not operating in hyperinflationary economies, the subsidiary's results, financial position and cash flows that do not have USD as their functional currency are translated into USD using the following exchange rates:

• Income, expense and cash flows using for each month the average exchange rate, with the US dollar values for each month being aggregated during the year
• Balance sheets using year-end exchange rates
• Resulting exchange rate differences are recognized in other comprehensive income

The hyperinflationary economies in which Novartis operates are Argentina and Venezuela. Venezuela was hyperinflationary for all years presented, and Argentina became hyperinflationary effective July 1, 2018, requiring retroactive implementation of hyperinflation accounting as of January 1, 2018.

The impact of the restatement of the non-monetary assets and liabilities with the general price index at the beginning of the period is recorded in retained earnings in equity. The subsequent gains or losses resulting from the restatement of non-monetary assets are recorded in "Other financial income and expense" in the consolidated income statement.

Acquisition of assets

Acquired assets are initially recognized on the balance sheet at cost if they meet the criteria for capitalization. If acquired as part of a business combination, the fair value of identified assets represents the cost for these assets. If separately acquired, the cost of the asset includes the purchase price and any directly attributable costs for bringing the asset into the condition to operate as intended. Expected costs for obligations to dismantle and remove property, plant and equipment when they are no longer used are included in their cost.

Property, plant and equipment

Property, plant and equipment are depreciated on a straight-line basis in the consolidated income statement

over their estimated useful lives. Leasehold land is depreciated over the period of its lease, whereas freehold land is not depreciated. The related depreciation expense is included in the costs of the functions using the asset.

Property, plant and equipment are assessed for impairment whenever there is an indication that the balance sheet carrying amount may not be recoverable using cash flow projections for the useful life.

The following table shows the respective useful lives for property, plant and equipment:

	Useful life
Buildings	20 to 40 years
Machinery and other equipment	
Machinery and equipment	7 to 20 years
Furniture and vehicles	5 to 10 years
Computer hardware	3 to 7 years

Government grants obtained for construction activities, including any related equipment, are deducted from the gross acquisition cost to arrive at the balance sheet carrying value of the related assets.

Goodwill and intangible assets

Goodwill

Goodwill arises in a business combination and is the excess of the consideration transferred to acquire a business over the underlying fair value of the net identified assets acquired. It is allocated to groups of cash-generating units (CGUs), which are usually represented by the reported segments. Goodwill is tested for impairment annually at the level of these groups of CGUs, and any impairment charges are recorded under “Other expense” in the consolidated income statement.

Intangible assets available for use

Novartis has the following classes of available-for-use intangible assets: Currently marketed products; Marketing know-how; Technologies; Other intangible assets (including computer software); and the Alcon brand name.

Currently marketed products represent the composite value of acquired intellectual property, patents, and distribution rights and product trade names.

Marketing know-how represents the value attributable to the expertise acquired for marketing and distributing Alcon surgical products.

Technologies represent identified and separable acquired know-how used in the research, development and production processes.

Significant investments in internally developed and acquired computer software are capitalized and included in the “Other” category and amortized once available for use.

The Alcon brand name is shown separately, as it is the only Novartis intangible asset that is available for use with an indefinite useful life. Novartis considers that it is appropriate that the Alcon brand name has an indefinite life since Alcon-branded products have a history of strong revenue and cash flow performance, and Novartis has the intent and ability to support the brand with spending to maintain its value for the foreseeable future.

Except for the Alcon brand name, intangible assets available for use are amortized over their estimated useful lives on a straight-line basis and are evaluated for potential impairment whenever facts and circumstances indicate that their carrying value may not be recoverable. The Alcon brand name is not amortized, but evaluated for potential impairment annually.

The following table shows the respective useful lives for available-for-use intangible assets and the location in the consolidated income statement in which the respective amortization and any potential impairment charge is recognized:

	Useful life	Income statement location for amortization and impairment charges
Currently marketed products	5 to 20 years	"Cost of goods sold"
Marketing know-how	25 years	"Cost of goods sold"
Technologies	10 to 20 years	

Other (including computer software)	3 to 7 years	"Cost of goods sold" or "Research and development" In the respective functional expense
Alcon brand name	Not amortized, indefinite useful life	"Other expense"

Intangible assets not yet available-for-use

Acquired research and development intangible assets, which are still under development and have accordingly not yet obtained marketing approval, are recognized as In-Process Research and Development (IPR&D).

IPR&D is not amortized, but evaluated for potential impairment on an annual basis or when facts and circumstances warrant. Any impairment charge is recorded in the consolidated income statement under “Research and development.” Once a project included in IPR&D has been successfully developed, it is transferred to the “Currently marketed products” category.

Impairment of goodwill and intangible assets

An asset is considered impaired when its balance sheet carrying amount exceeds its estimated recoverable amount, which is defined as the higher of its fair value less costs of disposal and its value in use. Usually, Novartis applies the fair value less costs of disposal method for its impairment assessment. In most cases, no directly observable market inputs are available to measure the fair value less costs of disposal. Therefore, an estimate is derived indirectly and is based on net present value techniques utilizing post-tax cash flows and discount rates. In the limited cases where the value in use method would be applied, net present value techniques would be applied using pre-tax cash flows and discount rates.

Fair value less costs of disposal reflects estimates of assumptions that market participants would be expected to use when pricing the asset or CGUs, and for this purpose, management considers the range of economic

conditions that are expected to exist over the remaining useful life of the asset.

The estimates used in calculating the net present values are highly sensitive and depend on assumptions specific to the nature of the Group's activities with regard to:

- Amount and timing of projected future cash flows
- Long-term sales forecasts
- Actions of competitors (launch of competing products, marketing initiatives, etc.)
- Sales erosion rates after the end of patent or other intellectual property rights protection, and timing of the entry of generic competition
- Outcome of research and development activities (compound efficacy, results of clinical trials, etc.)
- Amount and timing of projected costs to develop IPR&D into commercially viable products
- Probability of obtaining regulatory approval
- Future tax rate
- Appropriate royalty rate for the Alcon brand name
- Appropriate terminal growth rate
- Appropriate discount rate

Generally, for intangible assets with a definite useful life, Novartis uses cash flow projections for the whole useful life of these assets. For goodwill and the Alcon brand name, Novartis generally utilizes cash flow projections for a five-year period based on management forecasts, with a terminal value based on cash flow projections usually in line with inflation rates for later periods. Probability-weighted scenarios are typically used.

Discount rates used consider the Group's estimated weighted average cost of capital, adjusted for specific country and currency risks associated with cash flow projections to approximate the weighted average cost of capital of a comparable market participant.

Due to the above factors, actual cash flows and values could vary significantly from forecasted future cash flows and related values derived using discounting techniques.

Impairment of associated companies accounted for at equity

Novartis considers investments in associated companies for impairment evaluation whenever objective evidence indicates the net investment may be impaired, including when a quoted share price indicates a fair value less than the per-share balance sheet carrying value for the investment.

If the recoverable amount of the investment is estimated to be lower than the balance sheet carrying amount, an impairment charge is recognized for the difference in the consolidated income statement under "Income from associated companies."

Cash and cash equivalents

Cash and cash equivalents include highly liquid investments with original maturities of three months or less, which are readily convertible to known amounts of cash. Bank overdrafts are usually presented within current financial debts on the consolidated balance sheet, except in cases where a right of offset has been agreed with a bank, which then allows for presentation on a net basis.

Marketable securities, commodities and non-current financial assets

Commodities, which include gold bullion or coins, are valued at the lower of cost or fair value using current market prices. The changes in fair value below cost are immediately recorded in "Other financial income and expense."

Marketable securities are financial assets consisting principally of equity and debt securities as well as fund investments. Marketable securities held for short-term purposes are principally traded in liquid markets and are classified as marketable securities within current assets on the consolidated balance sheet. The financial impacts related to these financial assets are recorded in "Other financial income and expense" in the consolidated income statement. Marketable securities held for long-term strategic purposes are classified as non-current financial assets on the consolidated balance sheet. The financial impacts related to these financial assets are recorded in "Other income" and "Other expense" in the consolidated income statement.

Marketable securities are initially recorded at fair value on their trade date, which is different from the settlement date when the transaction is ultimately effected. Quoted securities are remeasured at each reporting date to fair value based on current market prices. If the market for a financial asset is not active or no market is available, fair values are established using valuation techniques. The majority of non-quoted investments are valued initially at fair value through the established purchase price between a willing buyer and seller. Non-quoted investments are subsequently

adjusted based on values derived from discounted cash flow analysis or other pricing models. These investment values are classified as “Level 3” in the fair value hierarchy.

From January 1, 2018, with the adoption of IFRS 9 Financial Instruments, the Group classifies and accounts for its marketable securities and non-current financial assets in the following categories:

• Debt securities are valued at fair value through other comprehensive income with subsequent recycling into the consolidated income statement, as they meet the “solely payment of principal and interest and business model” criteria. Unrealized gains and losses, except exchange gains and losses, are recorded as a fair value adjustment in the consolidated statement of comprehensive income. They are recognized in the consolidated income statement when the debt instrument is sold, at which time the gain is transferred to “Other financial income and expense.” Exchange gains and losses related to debt instruments are immediately recognized in the consolidated income statement to “Other financial income and expense.”

• Fund investments, equity securities of the Novartis Venture Fund and derivative assets are valued at fair value through profit and loss (FVPL). Unrealized gains and losses, including exchange gains and losses, are

recognized in the consolidated income statement, for marketable securities held for short-term purposes and derivative assets to “Other financial income and expense,” and for fund investments and equity securities valued at FVPL, held for strategic purposes, to “Other income” for gains and “Other expense” for losses.

• Equity securities held as strategic investments, typically held outside of the Novartis Venture Fund, are generally designated at date of acquisition as financial assets valued at fair value through other comprehensive income with no subsequent recycling through profit and loss. Unrealized gains and losses, including exchange gains and losses, are recorded as a fair value adjustment in the consolidated statement of comprehensive income. They are reclassified to retained earnings when the equity security is sold. If these equity securities are not designated at date of acquisition as financial assets valued at fair value through other comprehensive income, they are valued at FVPL, as described above.

• Other non-current financial assets, such as loans and long-term receivables from customers, advances and other deposits, are valued at amortized cost, which reflects the time value of money less any allowances for expected credit losses.

The Group assesses on a forward-looking basis the expected credit losses associated with its debt securities valued at fair value through other comprehensive income. Impairments on debt securities are recorded in “Other financial income and expense.”

For other financial assets valued at amortized costs, impairments, which are based on their expected credit losses, and exchange rate losses are included in “Other expense” in the consolidated income statement, and exchange rate gains and interest income, using the effective interest rate method, are included in “Other income” or “Other financial income” in the consolidated income statement, depending on the nature of the item.

Prior to the adoption of IFRS 9, the Group classified and accounted for its marketable securities and non-current financial assets in the following categories:

The Group classified all its equity and quoted debt securities as well as fund investments as available for sale, as they were not acquired to generate profit from short-term fluctuations in price. Unrealized gains, except exchange gains related to quoted debt instruments, were recorded as a fair value adjustment in the consolidated statement of comprehensive income. They were recognized in the consolidated income statement when the financial asset was sold, at which time the gain was transferred either to “Other financial income and expense,” for the marketable securities held for short-term non-strategic purposes, or to “Other income,” for all other equity securities and fund investments. Exchange gains related to quoted debt instruments were immediately recognized in the consolidated income statement under “Other financial income and expense.”

A security was assessed for impairment when its market value at the balance sheet date was less than initial cost reduced by any previously recognized impairment. Impairments on equity securities, quoted debt securities and fund investments, and exchange rate losses on quoted debt securities in a foreign currency that were held for short-term non-strategic purposes were recorded in “Other financial income and expense.” Impairments were recorded for all other equity securities and other fund investments in “Other expense” in the consolidated income statement.

Other non-current financial assets, including loans held for long-term strategic purposes, were carried at amortized cost, which reflects the time value of money less any allowances for uncollectable amounts. For these financial assets, impairments and exchange rate losses were included in “Other expense” in the consolidated income statement, and exchange rate gains and interest income using the effective interest rate method were included in “Other income” in the consolidated income statement.

Section “Impact of adopting significant new IFRS standards in 2018” in this Note 1 and Note 29 provides additional disclosure on the impact of adoption of IFRS 9 Financial Instruments.

Derivative financial instruments

Derivative financial instruments are initially recognized in the balance sheet at fair value and are remeasured to their current fair value at the end of each subsequent reporting period. The valuation of a forward exchange rate contract is based on the discounted cash flow model, using interest curves and spot rates at the reporting date as observable inputs.

Options are valued based on a modified Black-Scholes model using volatility and exercise prices as major observable inputs.

The Group utilizes derivative financial instruments for the purpose of hedging to reduce the volatility in the Group’s performance due to the exposure of various types of business risks. To mitigate these risks, the Group enters into

certain derivative financial instruments. The risk reduction is obtained because the derivative's value or cash flows are expected, wholly or partly, to offset changes in the value or cash flows of the recognized assets or liabilities. The overall strategy is aiming to mitigate the currency and interest exposure risk of positions that are contractually agreed, and to partially mitigate the exposure risk of selected anticipated transactions.

Certain derivative financial instruments meet the criteria for hedge accounting treatment. A prerequisite for obtaining this accounting-hedge relationship is extensive documentation on inception and proving on a regular basis that the economic hedge is effective for accounting purposes. Other derivative financial instruments do not meet the criteria to qualify for hedge accounting. Changes in the fair value of those derivative instruments are recognized immediately in "Other financial income and expense" in the consolidated income statement.

In addition, the Group has designated certain long-term debt components as hedges of the translation risk arising on certain net investments in foreign operations. On consolidation, foreign currency differences arising on long-term debt designated as net investment hedges of a foreign operation are recognized in other compre-

hensive income and accumulated in currency translation effects, to the extent that the hedge is effective. The foreign currency differences arising from hedge ineffectiveness are recognized in the income statement in “Other financial income and expense.”

When a hedged net investment is disposed of, the proportionate portion of the cumulative amount recognized in equity in relation to the hedged net investment is transferred to the consolidated income statement as an adjustment to the gain or loss on disposal.

Inventories

Inventory is valued at acquisition or production cost determined on a first-in, first-out basis. This value is used for the “Cost of goods sold” in the consolidated income statement. Unsalable inventory is fully written off in the consolidated income statement under “Cost of goods sold.”

Trade receivables

Trade receivables are initially recognized at their invoiced amounts, including any related sales taxes less adjustments for estimated revenue deductions such as rebates, chargebacks and cash discounts.

From January 1, 2018, with the adoption of IFRS 9 Financial Instruments, provisions for expected credit losses are established using an expected credit loss model (ECL). The provisions are based on a forward-looking ECL, which includes possible default events on the trade receivables over the entire holding period of the trade receivable. These provisions represent the difference between the trade receivable’s carrying amount in the consolidated balance sheet and the estimated collectible amount. Charges for doubtful trade receivables are recorded as marketing and selling costs recognized in the consolidated income statement within “Selling, general and administration” expenses.

Prior to the adoption of IFRS 9, the Group’s accounting policy for provisions for doubtful trade receivables was as follows:

Provisions for doubtful trade receivables were established once there was an indication that it was likely that a loss would be incurred. These provisions represent the difference between the trade receivable’s carrying amount in the consolidated balance sheet and the estimated collectible amount. Significant financial difficulties of a customer, such as probability of bankruptcy, financial reorganization, default or delinquency in payments, were considered indicators that recovery of the trade receivable was doubtful. Charges for doubtful trade receivables, recorded as marketing and selling costs, were recognized in the consolidated income statement within “Selling, general and administration” expenses.

Section “Impact of adopting significant new IFRS standards in 2018” in this Note 1 and Note 29 provides additional disclosure on the impact of adoption of IFRS 9 Financial Instruments.

Legal and environmental liabilities

Novartis and its subsidiaries are subject to contingencies arising in the ordinary course of business, such as patent litigation, environmental remediation liabilities and other product-related litigation, commercial litigation, and governmental investigations and proceedings. Provisions are recorded where a reliable estimate can be made of the probable outcome of legal or other disputes against the subsidiary.

Contingent consideration

In a business combination or divestment of a business, it is necessary to recognize contingent future payments to previous owners, representing contractually defined potential amounts as a liability or asset. Usually for Novartis, these are linked to milestone or royalty payments related to certain assets and are recognized as a financial liability or financial asset at their fair value, which is then remeasured at each subsequent reporting date. These estimations typically depend on factors such as technical milestones or market performance, and are adjusted for the probability of their likelihood of payment and, if material, are appropriately discounted to reflect the impact of time.

Changes in the fair value of contingent consideration liabilities in subsequent periods are recognized in the consolidated income statement in “Cost of goods sold” for currently marketed products and in “Research and development” for IPR&D. Changes in contingent consideration assets are recognized in “Other income” or “Other expense,” depending on its nature.

The effect of unwinding the discount over time is recognized for contingent liabilities in “Interest expense” and for contingent assets as interest income recognized in the consolidated income statement within “Other financial income and expense.”

Defined benefit pension plans and other post-employment benefits

The liability in respect of defined benefit pension plans and other post-employment benefits is the defined benefit obligation calculated annually by independent actuaries using the projected unit credit method. The current service cost for such post-employment benefit plans is included in the personnel expenses of the various functions where the associates are employed, while the net interest on the net defined benefit liability or asset is recognized as “Other expense” or “Other income.”

Treasury shares

Treasury shares are initially recorded at fair value on their trade date, which is different from the settlement date, when the transaction is ultimately effected. Treasury shares are deducted from consolidated equity at their nominal value of CHF 0.50 per share. Differences between the nominal amount and the transaction price on purchases or sales of treasury shares with third par-

ties, or the value of services received for the shares allocated to associates as part of share-based compensation arrangements, are recorded in “Retained earnings” in the consolidated statement of changes in equity.

Revenue recognition

From January 1, 2018, with the implementation of the new standard IFRS 15 Revenue from Contracts with Customers, the Group accounting policy for revenue recognition is as follows:

Revenue on the sale of Novartis Group products and services, which is recorded as “Net sales” in the consolidated income statement, is recognized when a contractual promise to a customer (performance obligation) has been fulfilled by transferring control over the promised goods and services to the customer, substantially all of which is at the point in time of shipment to or receipt of the products by the customer or when the services are performed. If contracts contain customer acceptance provisions, revenue would be recognized upon the satisfaction of acceptance criteria. If products are stockpiled at the request of the customer, revenue is only recognized once the products have been inspected and accepted by the customer, and there is no right of return or replenishment on product expiry. The amount of revenue to be recognized is based on the consideration Novartis expects to receive in exchange for its goods and services. If a contract contains more than one performance obligation, the consideration is allocated based on the standalone selling price of each performance obligation.

Surgical equipment may be sold together with other products and services under a single contract. Revenues are recognized upon satisfaction of each of the performance obligations in the contract and the consideration is allocated based on the standalone selling price of each performance obligation.

For surgical equipment, in addition to cash and installment sales, revenue is recognized under finance and operating lease arrangements. Arrangements in which Novartis transfers substantially all the risks and rewards incidental to ownership to the customer are treated as finance lease arrangements. Revenue from finance lease arrangements is recognized at amounts equal to the fair value of the equipment, which approximate the present value of the minimum lease payments under the arrangements. As interest rates embedded in lease arrangements are approximately market rates, revenue under finance lease arrangements is comparable to revenue for outright sales. Finance income for arrangements longer than twelve months is deferred and subsequently recognized based on a pattern that approximates the use of the effective interest method and recorded in “Other income.” Operating lease revenue for equipment rentals is recognized on a straight-line basis over the lease term.

The consideration Novartis receives in exchange for its goods or services may be fixed or variable. Variable consideration is only recognized when it is highly probable that a significant reversal will not occur. The most common elements of variable consideration are listed below.

• Rebates and discounts granted to government agencies, wholesalers, retail pharmacies, managed healthcare organizations and other customers are provisioned and recorded as a deduction from revenue at the time the related revenues are recorded or when the incentives are offered. They are calculated on the basis of historical experience and the specific terms in the individual agreements.

• Refunds granted to healthcare providers under innovative pay-for-performance agreements are provisioned and recorded as a revenue deduction at the time the related sales are recorded. They are calculated on the basis of historical experience and clinical data available for the product, as well as the specific terms in the individual agreements. In cases where historical experience and clinical data are not sufficient for a reliable estimation of the outcome, revenue recognition is deferred until the uncertainty is resolved or until such history is available.

• Cash discounts offered to customers are to encourage prompt payment and are provisioned and recorded as revenue deductions at the time the related sales are recorded.

• Shelf stock adjustments are generally granted to customers, primarily of the Sandoz Division, to cover the inventory held by them at a time the price decline becomes effective. Revenue deduction provisions for shelf stock adjustments are recorded when the price decline is anticipated, based on the impact of the price decline on the customer’s estimated inventory levels.

• Sales returns provisions are recognized and recorded as revenue deductions when there is historical experience of Novartis agreeing to customer returns and Novartis can reasonably estimate expected future returns. In doing so, the estimated rate of return is applied, determined on the basis of historical experience of customer returns and considering any other relevant factors. This is applied to the amounts invoiced, also considering the amount of returned products to be destroyed versus products that can be placed back in inventory for resale. Where shipments are made on a resale or return basis, without sufficient historical experience for estimating sales returns, revenue is only

recorded when there is evidence of consumption or when the right of return has expired.

Provisions for revenue deductions are adjusted to actual amounts as rebates, discounts and returns are processed. The provision represents estimates of the related obligations, requiring the use of judgment when estimating the effect of these sales deductions.

“Other revenue” includes income from profit-sharing arrangements with our collaboration partners, and royalty and milestone income from the out-licensing of intellectual property (IP) when Novartis retains an interest in the IP through a license. Royalty income earned through a license is recognized when the underlying sales have occurred. Milestone income is recognized at the point in time when it is highly probable that the respective milestone event criteria is met, and the risk of reversal of revenue recognition is remote. Other revenue also includes revenue from activities such as manufacturing or other services rendered, to the extent such revenue is not

recorded under net sales, and is recognized when control transfers to the third party and our performance obligations are satisfied.

Prior to the adoption of IFRS 15 on January 1, 2018, the Group accounting policy for revenue recognition was as follows:

Revenue was recognized on the sale of Novartis Group products and services, and was recorded as “Net sales” in the consolidated income statement when there was persuasive evidence that a sales arrangement exists; title, risks and rewards for the products are transferred to the customer; the price was determinable; and collectability was reasonably assured. If contracts contain customer acceptance provisions, revenue would be recognized upon the satisfaction of acceptance criteria. If products are stockpiled at the request of the customer, revenue was only recognized once the products have been inspected and accepted by the customer, and there was no right of return or replenishment on product expiry.

Surgical equipment may be sold together with other products and services under a single contract. The total consideration was allocated to the separate elements based on their relative fair values. Revenue was recognized once the recognition criteria have been met for each element of the contract.

For surgical equipment, in addition to cash and installment sales, revenue was recognized under finance and operating lease arrangements. Arrangements in which Novartis transfers substantially all the risks and rewards incidental to ownership to the customer are treated as finance lease arrangements. Revenue from finance lease arrangements was recognized at amounts equal to the fair values of the equipment, which approximate the present values of the minimum lease payments under the arrangements. As interest rates embedded in lease arrangements are approximately market rates, revenue under finance lease arrangements was comparable to revenue for outright sales. Finance income for arrangements in excess of 12 months was deferred and subsequently recognized based on a pattern that approximates the use of the effective interest method and recorded in “Other income.” Operating lease revenue for equipment rentals was recognized on a straight-line basis over the lease term.

Provisions for rebates and discounts granted to government agencies, wholesalers, retail pharmacies, managed healthcare organizations and other customers are recorded as a deduction from revenue at the time the related revenues are recorded or when the incentives are offered. They are calculated on the basis of historical experience and the specific terms in the individual agreements.

Provisions for refunds granted to healthcare providers under innovative pay-for-performance agreements are recorded as a revenue deduction at the time the related sales are recorded. They are calculated on the basis of historical experience and clinical data available for the product, as well as the specific terms in the individual agreements. In cases where historical experience and clinical data are not sufficient for a reliable estimation of the outcome, revenue recognition was deferred until such history was available.

Cash discounts are offered to customers to encourage prompt payment and are recorded as revenue deductions.

Following a decrease in the price of a product, we generally grant customers a “shelf stock adjustment” for their existing inventory for the involved product. Provisions for shelf stock adjustments, which are primarily relevant within the Sandoz Division, are determined at the time of the price decline or at the point of sale, if the impact of a price decline on the products sold can be reasonably estimated based on the customer’s inventory levels of the relevant product.

When there was historical experience of Novartis agreeing to customer returns, and Novartis could reasonably estimate expected future returns, a provision was recorded for estimated sales returns. In doing so, the estimated rate of return was applied, determined based on historical experience of customer returns and considering any other relevant factors. This was applied to the amounts invoiced, also considering the amount of returned products to be destroyed versus products that could be placed back in inventory for resale. Where shipments are made on a resale or return basis, without sufficient historical experience for estimating sales returns, revenue was only recorded when there was evidence of consumption or when the right of return had expired.

Provisions for revenue deductions were adjusted to actual amounts as rebates, discounts and returns were processed. The provision represents estimates of the related obligations, requiring the use of judgment when estimating the effect of these sales deductions.

“Other revenue” includes royalty and profit-sharing income, and revenue from activities such as manufacturing services or other services rendered, to the extent such revenue was not recorded under net sales.

Section “Impact of adopting significant new IFRS standards in 2018” in this Note 1 and Note 29 provides additional disclosure on the impact of adoption.

Research and development

Internal research and development (R&D) costs are fully charged to “Research and development” in the consolidated income statement in the period in which they are incurred. The Group considers that regulatory and other uncertainties inherent in the development of new products preclude the capitalization of internal development expenses as an intangible asset until marketing approval from a regulatory authority is obtained in a major market such as the United States, the European Union, Switzerland or Japan.

Payments made to third parties, such as contract research and development organizations in compensation for subcontracted R&D, that are deemed to not transfer intellectual property to Novartis are expensed as internal R&D expenses in the period in which they are incurred. Such payments are only capitalized if they meet the criteria for recognition of an internally generated intangible asset, usually when marketing approval has been achieved from a regulatory authority in a major market.

Payments made to third parties to in-license or acquire intellectual property rights, compounds and products, including initial upfront and subsequent milestone payments, are capitalized, as are payments for other assets, such as technologies to be used in R&D activities. If additional payments are made to the originator company to continue to perform R&D activities, an evaluation is made as to the nature of the payments. Such additional payments will be expensed if they are deemed to be compensation for subcontracted R&D services not resulting in an additional transfer of intellectual property rights to Novartis. Such additional payments will be capitalized if they are deemed to be compensation for the transfer to Novartis of additional intellectual property developed at the risk of the originator company. Subsequent internal R&D costs in relation to IPR&D and other assets are expensed, since the technical feasibility of the internal R&D activity can only be demonstrated by the receipt of marketing approval for a related product from a regulatory authority in a major market.

Costs for post-approval studies performed to support the continued registration of a marketed product are recognized as marketing expenses. Costs for activities that are required by regulatory authorities as a condition for obtaining marketing approval are capitalized and recognized as currently marketed products.

Inventory produced ahead of regulatory approval is fully provisioned, and the charge is included in “Other expense” in the consolidated income statement, as its ultimate use cannot be assured. If this inventory can be subsequently sold, the provision is released to “Other income” in the consolidated income statement either on approval by the appropriate regulatory authority or, exceptionally in Europe, on recommendation by the Committee for Medicinal Products for Human Use (CHMP), if approval is virtually certain.

Share-based compensation

Vested Novartis shares and American Depositary Receipts (ADRs) that are granted as compensation are valued at their market value on the grant date and are immediately expensed in the consolidated income statement.

The fair values of unvested restricted shares, restricted share units (RSUs) and performance share units (PSUs) in Novartis shares and ADRs granted to associates as compensation are recognized as an expense over the related vesting period. The expense recorded in the consolidated income statement is included in the personnel expenses of the various functions where the associates are employed.

Unvested restricted shares, restricted ADRs and RSUs are only conditional on the provision of services by the plan participant during the vesting period. They are valued using their fair value on the grant date. As RSUs do not entitle the holder to dividends, the fair value is based on the Novartis share price at the grant date adjusted for the net present value of the dividends expected to be paid during the holding period. The fair value of these grants, after making adjustments for assumptions related to their forfeiture during the vesting period, is expensed on a straight-line basis over the respective vesting period.

PSUs are subject to certain performance criteria being achieved during the vesting period and require plan participants to provide services during the vesting period. PSUs granted under plans defined as Long-Term Performance Plans are subject to performance criteria based on Novartis internal performance metrics. The expense is determined taking into account assumptions concerning performance during the period against targets and expected forfeitures due to plan participants not meeting their service conditions. These assumptions are periodically adjusted. Any change in estimates for past services is recorded immediately as an expense or income in the consolidated income statement, and amounts for future periods are expensed over the remaining vesting period. As a result, at the end of the vesting period, the total charge during the whole vesting period represents the amount that will finally vest. The number of equity instruments that finally vest is determined at the vesting date.

PSUs granted under the Long-Term Relative Performance Plan (LTRPP) are conditional on the provision of services by the plan participant during the vesting period as well as on the total shareholder return (TSR) performance of Novartis relative to a specific peer group of companies over the vesting period. These performance conditions are based on variables that can be observed in the market. IFRS requires that these observations are taken into account in determining the fair value of these PSUs at the date of grant. Novartis has determined the fair value of these PSUs at the date of grant using a Monte Carlo simulation model. The total fair value of this grant is expensed on a straight-line basis over the vesting period. Adjustments to the number of equity instruments granted are only made if a plan participant does not fulfill the service conditions.

Measuring the fair values of PSUs granted under the LTRPP requires estimates. The Monte Carlo simulation used for determining the fair value of the PSUs related to the LTRPP requires as input parameters the probability of factors related to uncertain future events; the term of the award; the grant price of underlying shares or ADRs; expected

volatilities; the expected correlation matrix of the underlying equity instruments with those of the peer group of companies; and the risk-free interest rate.

If a plan participant leaves Novartis for reasons other than retirement, disability or death, then unvested restricted shares, restricted ADRs, RSUs and PSUs are forfeited, unless determined otherwise by the provision of the plan rules or by the Compensation Committee of the Novartis Board of Directors, for example, in connection with a reorganization or divestment.

Government grants

Grants from governments or similar organizations are recognized at their fair value when there is a reasonable assurance that the grant will be received and the Group will comply with all attached conditions.

Government grants related to income are deferred and recognized in the consolidated income statement over the period necessary to match them with the related costs that they are intended to compensate.

The accounting policy for property, plant and equipment describes the treatment of any related grants.

Restructuring charges

Restructuring provisions are recognized for the direct expenditures arising from the restructuring, where the plans are sufficiently detailed and where appropriate communication to those affected has been made.

Charges to increase restructuring provisions are included in “Other expense” in the consolidated income statements. Corresponding releases are recorded in “Other income” in the consolidated income statement.

Taxes

Taxes on income are provided in the same periods as the revenues and expenses to which they relate and include interest and penalties incurred during the period. Deferred taxes are determined using the comprehensive liability method and are calculated on the temporary differences that arise between the tax base of an asset or liability and its carrying value in the balance sheet prepared for consolidation purposes, except for those temporary differences related to investments in subsidiaries and associated companies, where the timing of their reversal can be controlled and it is probable that the difference will not reverse in the foreseeable future. Since the retained earnings are reinvested, withholding or other taxes on eventual distribution of a subsidiary’s retained earnings are only taken into account when a dividend has been planned.

The estimated amounts for current and deferred tax assets or liabilities, including any amounts related to any uncertain tax positions, are based on currently known facts and circumstances. Tax returns are based on an interpretation of tax laws and regulations, and reflect estimates based on these judgments and interpretations. The tax returns are subject to examination by the competent taxing authorities, which may result in an assessment being made requiring payments of additional tax, interest or penalties. Inherent uncertainties exist in the estimates of the tax positions.

Non-current assets held for sale

Non-current assets are classified as assets held for sale when their carrying amount is to be recovered principally through a sale transaction and a sale is considered highly probable. They are stated at the lower of carrying amount and fair value less costs of disposal. Assets held for sale, included within a disposal group or discontinued operations are not depreciated or amortized.

Transaction costs recorded in equity

Transaction costs that are directly attributable to the potential distribution (spin-off) of Alcon to the Novartis shareholders, and that would otherwise have been avoided, are recorded as a deduction from equity. If the spin-off does not occur, the cost will be recycled into the consolidated income statement.

Impact of adopting significant new IFRS standards in 2018

The following new IFRS standards have been adopted by Novartis from January 1, 2018:

IFRS 9 Financial Instruments

Novartis implemented IFRS 9 Financial Instruments as of January 1, 2018, which substantially changes the classification and measurement of financial instruments. The new standard requires impairments to be based on a forward-looking model, changes the approach to hedging financial exposures and related documentation, changes the recognition of certain fair value changes, and amends disclosure requirements.

The impairment of financial assets, including trade and lease receivables, is now assessed using an expected credit loss model; previously, the incurred loss model was used. Given the nature of Novartis financial assets, the Group had no significant impact to its provisions for doubtful accounts or impairments from this change.

The new hedge accounting model introduced by the standard requires hedge accounting relationships to be based upon the Group’s own risk management strategy and objectives, and to be discontinued only when the relationships no longer qualify for hedge accounting. There was no impact upon adoption of the new standard, as the Group’s existing hedge relationships continue to be designated as such under the new hedge accounting requirements.

The most significant impact to the Group upon adoption of IFRS 9 relates to the treatment of the unrealized gains and losses from changes in fair value on certain of the Group’s financial instruments, which were previously classified as available-for-sale marketable securities and financial investments. The unrealized gains and losses (to the extent of

previous recognized unrealized gains), which the Group recognized previously in the consolidated statement of other comprehensive income, are from January 1, 2018, recognized in the consolidated income statement. This approach is applied to equity securities where the fair value through other comprehensive income irrevocable option is not applied.

The Group applied the modified retrospective method upon adoption of IFRS 9 on January 1, 2018. This method requires the recognition of the cumulative effect of initially applying IFRS 9 to retained earnings and not to restate prior years. The cumulative effect recorded at January 1, 2018, was an increase to retained earnings of USD 177 million.

IFRS 15 Revenue from Contracts with Customers

Novartis implemented the new standard IFRS 15 Revenue from Contracts with Customers as of January 1, 2018. The new standard amends revenue recognition requirements and establishes principles for reporting information about the nature, amount, timing and uncertainty of revenue and cash flows arising from contracts with customers. The standard replaces IAS 18 Revenue and IAS 11 Construction contracts and related interpretations.

The impacts of adoption of the new standard are summarized below:

• The Group's "Net sales" are derived from the sale of drug substances, vision care products, surgical equipment, and other products and services, where control transfers to our customers and our performance obligations are satisfied at the time of shipment to or receipt of the products by the customer or when the services are performed. The adoption of IFRS 15 did not significantly change the timing or amount of revenue recognized under these arrangements.

• The Group's "Other revenue" consists of royalty income from the out-licensing of intellectual property (IP), which is recognized as earned, and from manufacturing and other services, where revenue is recognized when control transfers to the third party and our performance obligations are satisfied. The adoption of IFRS 15 did not significantly change the timing or amount of revenue recognized from these manufacturing and other services arrangements, nor did it change accounting for these royalty arrangements, as the standard's royalty exception is applied for IP licenses. "Other revenue" also includes revenue from profit-sharing arrangements with our collaboration partners. Furthermore, the Group receives milestone payments related to the out-licensing of IP. The adoption of IFRS 15 did not significantly change the timing or amount of revenue recognized under these arrangements.

The Group applied the modified retrospective method upon adoption of IFRS 15 on January 1, 2018. This method requires the recognition of the cumulative effect of initially applying IFRS 15 to retained earnings and not to restate prior years. The cumulative effect recorded at January 1, 2018, was an increase to retained earnings of USD 60 million.

For further information on the impact of adoption of IFRS 9 Financial Instruments and IFRS 15 Revenue from Contracts with Customers, see Note 29.

New IFRS standards effective as of January 1, 2019

IFRS 16 Leases

IFRS 16 Leases substantially changes the financial statements as the majority of leases for which the company is the lessee will become on-balance sheet liabilities with corresponding right-of-use assets on the balance sheet. The lease liability reflects the net present value of the remaining lease payments, and the right-of-use asset corresponds to the lease liability, adjusted for payments made before the commencement date, lease incentives and other items related to the lease agreement. The standard replaces IAS 17 Leases.

Upon adoption of the new standard, a portion of the annual operating lease costs, which is currently fully recognized as a functional expense, will be recorded as interest expense. In addition, the portion of the annual lease payments recognized in the cash flow statement as a reduction of the lease liability will be recognized as an outflow from financing activities, which currently is fully recognized as an outflow from operating activities. Given the leases involved and the current low interest rate environment, the Group does not expect these effects to be significant.

The Group will implement the new standard on January 1, 2019, and will apply the modified retrospective method, with right-of-use assets measured at an amount equal to the lease liability, adjusted by the amount of the prepaid or accrued lease payments relating to those leases recognized in the balance sheet immediately before the date of initial application and will not restate prior years.

Results of our impact assessment:

The undiscounted operating lease commitments as of December 31, 2018 disclosed in Note 27, amounted to USD 3.6 billion. This includes approximately USD 0.3 billion of leases with a commencement date in 2019 and short-term leases as well as low-value leases that will be recognized on a straight-line basis as expense in profit and loss. For the remaining lease commitments of USD 3.3 billion, the Group expects to recognize on January 1, 2019, lease liabilities in the range of USD 1.9 billion and right-of-use assets in the range of USD 1.7 billion (after adjustments for the approximately USD 0.2 billion prepayments and accrued lease payments recognized as at December 31, 2018). This

does not include the right to use assets and lease liability on finance lease agreements of USD 79 million and USD 92 million, respectively. We expect an insignificant impact to retained earnings upon adoption of IFRS 16 to arise from subleases that were accounted for as operating lease agreements under IAS 17 and are accounted for as finance leases under IFRS 16.

As a lessor, the Group does not expect any significant impact upon adoption.

There are no other IFRS standards or interpretations not yet effective that would be expected to have a material impact on the Group.

2. Significant transactions

Significant transactions in 2018

Innovative Medicines – acquisition of Advanced Accelerator Applications S.A.

On October 30, 2017, Novartis entered into a binding memorandum of understanding with Advanced Accelerator Applications S.A. (AAA), a company headquartered in Saint-Genis-Pouilly, France, under which Novartis agreed to commence a tender offer for 100% of the share capital of AAA subject to certain conditions. Novartis commenced the tender offer on December 7, 2017, to purchase all of the outstanding ordinary shares for a price of USD 41 per share and USD 82 per American Depositary Share (ADS), each representing two ordinary shares of AAA, which expired on January 19, 2018. The offer valued AAA's equity at USD 3.9 billion, on a fully diluted basis.

As of January 19, 2018, the expiration date of the tender offer, approximately 97% of the then-outstanding fully diluted ordinary shares, including ordinary shares represented by ADSs (hereinafter collectively referred to as "the outstanding shares"), were validly tendered. On January 22, 2018, Novartis accepted and paid USD 3.9 billion for the outstanding shares tendered in the offer. On January 22, 2018, Novartis commenced a subsequent offering period that expired on January 31, 2018. As of the expiration of the subsequent offering period, an additional 1.8% of the outstanding shares were validly tendered. Novartis accepted and paid approximately USD 60 million, resulting in an increase in Novartis ownership in AAA to 98.7%.

The fair value of the total purchase consideration was USD 3.9 billion. The purchase price allocation resulted in net identifiable assets of approximately USD 1.9 billion, consisting of USD 2.5 billion intangible assets, USD 0.6 billion net deferred tax liabilities, and goodwill of approximately USD 2.0 billion. In 2018, from the date of the acquisition the business generated net sales of USD 0.4 billion. Management estimates net sales for the entire year 2018 would have amounted to USD 0.4 billion had AAA been acquired at the beginning of 2018. The 2018 results from operations since the acquisition were not material.

As of December 31, 2018, Novartis held 99.1% of the then-outstanding fully diluted ordinary shares, including ordinary shares represented by ADSs.

AAA is a radiopharmaceutical company that develops, produces and commercializes molecular nuclear medicines – including *Lutathera* (USAN: lutetium Lu 177 dotatate/INN: lutetium (^{177}Lu) oxodotreotide), a first-in-class radioligand therapy product for neuroendocrine tumors – and a portfolio of diagnostic products. Radiopharmaceuticals, such as *Lutathera*, are unique medicinal formulations containing radioisotopes, which are used clinically for both diagnosis and therapy.

Innovative Medicines – acquisition of AveXis, Inc.

On April 6, 2018, Novartis entered into an agreement and plan of merger with AveXis, Inc., a US-based clinical stage gene therapy company, under which Novartis commenced on April 17, 2018, a tender offer to purchase all outstanding common stock of AveXis, Inc. for USD 218 per share in cash. On May 15, 2018, Novartis completed the acquisition of the common stock of AveXis, Inc. and paid a total of USD 8.7 billion.

The fair value of the total purchase consideration was USD 8.7 billion. The purchase price allocation resulted in net identifiable assets of approximately USD 7.2 billion, consisting of USD 8.5 billion intangible assets, USD 1.6 billion net deferred tax liabilities and other net assets of USD 0.3 billion, and goodwill of approximately USD 1.5 billion. Results of operations since the date of acquisition were not material.

AveXis, Inc. is focused on developing and commercializing novel treatments for patients suffering from rare and life-threatening neurological genetic diseases. AveXis, Inc.'s initial product candidate, AVXS-101, is a proprietary gene therapy currently in development for the treatment of spinal muscular atrophy (SMA) type 1 – the leading genetic cause of infant mortality – and SMA types 2 and 3. In addition, AveXis, Inc. has a pipeline of other novel treatments for rare neurological diseases, including Rett syndrome (RTT) and a genetic form of amyotrophic lateral sclerosis (ALS) caused by mutations in the superoxide dismutase 1 (SOD1) gene.

Innovative Medicines – acquisition of Endocyte, Inc.

On October 18, 2018, Novartis entered into an agreement and plan of merger with Endocyte, a US-based biopharmaceutical company focused on developing targeted therapeutics for cancer treatment. The transaction was completed on December 21, 2018. Under the terms of the agreement, Novartis acquired all outstanding shares of Endocyte common stock for USD 24 per share. The total consideration amounted to USD 2.1 billion.

The fair value of the total purchase consideration was USD 2.1 billion. The preliminary purchase price allocation resulted in net identifiable assets of approximately USD 1.5 billion, consisting of USD 1.5 billion intangible assets,

USD 0.3 billion net deferred tax liabilities and other net assets of USD 0.3 billion, and goodwill of approximately USD 0.6 billion. The purchase price allocation is preliminary as the transaction closed on December 21, 2018, which is close to the Group's year-end and therefore not providing sufficient time to complete the valuation of the intangible assets, deferred taxes, assumed liabilities and goodwill. If new information obtained within 12 months from December 21, 2018, about facts and circumstances that existed at the date of the acquisition identifies adjustments to the above amounts, or any additional provisions that existed at the date of acquisition, then the accounting for the acquisition will be revised. The Group currently does not expect such potential revisions to be material.

Endocyte uses drug conjugation technology to develop targeted therapies with companion imaging agents, including 177Lu-PSMA-617, a potential first-in-class investigational radioligand therapy for the treat-

ment of metastatic castration-resistant prostate cancer (mCRPC).

Corporate – divestment of 36.5% stake in GlaxoSmithKline Consumer Healthcare Holdings Ltd.

On March 27, 2018, Novartis entered into an agreement with GlaxoSmithKline plc (GSK) to divest its 36.5% stake in GlaxoSmithKline Consumer Healthcare Holdings Ltd. to GSK for USD 13.0 billion in cash. As a result, Novartis discontinued the use of equity method accounting starting from April 1, 2018.

On June 1, 2018, the transaction closed and Novartis realized a pre-tax gain of USD 5.8 billion, recorded in income from associated companies.

Significant pending transaction

Sandoz – divestment of US dermatology business and generic US oral solids portfolio

On September 6, 2018, Novartis announced it has agreed to sell selected portions of its Sandoz US portfolio, specifically the Sandoz US dermatology business and generic US oral solids portfolio, to Aurobindo Pharma USA Inc. (Aurobindo), for USD 0.8 billion in cash and potential earn-outs.

The Sandoz US portfolios to be sold to Aurobindo include approximately 300 products as well as additional development projects. The sale includes the Sandoz US generic and branded dermatology businesses as well as its dermatology development center. As part of the transaction, Aurobindo will acquire the manufacturing facilities in Wilson, North Carolina, and in Hicksville and Melville, New York.

The transaction is expected to close in the course of 2019, following the completion of customary closing conditions. As the fair value of the consideration (USD 0.8 billion) less costs to sell is below the carrying value of the divested business (USD 1.0 billion, which includes an allocation of Sandoz goodwill of USD 0.2 billion), an impairment of the net assets to be divested in the amount of USD 0.2 billion was recognized as a reduction to goodwill.

In the Group's consolidated balance sheet at December 31, 2018, the business assets and liabilities are separately shown as assets and liabilities of disposal group held for sale.

The disposal group, assets and liabilities classified as held for sale consist of the following:

(USD millions)	December 31, 2018
Assets of disposal group classified as held for sale	
Property, plant and equipment	148
Intangible assets other than goodwill	478
Deferred tax assets	8
Other non-current assets	1
Inventories	165
Other current assets	7
Total	807

(USD millions)	December 31, 2018
Liabilities of disposal group classified as held for sale	
Deferred tax liabilities	2
Provisions and other non-current liabilities	4
Provisions and other current liabilities	45
Total	51

There are no cumulative income or expenses included in other comprehensive income relating to the disposal group.

Significant transactions in 2017

Innovative Medicines – acquisition of Ziarco Group Limited

On January 20, 2017, Novartis acquired Ziarco Group Limited (Ziarco), a privately held company in the United Kingdom that focuses on the development of novel treatments in dermatology. This acquisition adds a once-daily oral H4 receptor antagonist in development for atopic dermatitis, commonly known as eczema, to complement the Novartis dermatology portfolio and pipeline. The fair value of the total purchase consideration was USD 420 million. The amount consisted of an initial cash payment of USD 325 million and the net present value of the contingent consideration of USD 95 million, due to Ziarco shareholders, which they are eligible to receive upon the achievement of specified development milestones. The purchase price allocation resulted in net identifiable assets of USD 395 million and goodwill of USD 25 million. The 2017 results of operations since the date of acquisition were not

material.

Innovative Medicines – acquisition of Encore Vision, Inc.

On January 20, 2017, Novartis acquired Encore Vision, Inc. (Encore), a privately-held company in Fort Worth, Texas, in the United States, that focuses on the development of a novel treatment in presbyopia. The fair value of the total purchase consideration was USD 456 million. The amount consisted of an initial cash payment of USD 366 million and the net present value of the contingent consideration of USD 90 million, due to Encore shareholders, which they are eligible to receive upon the achievement of specified development and commercialization milestones. The purchase price allocation resulted in net identifiable assets of USD 389 million and goodwill of USD 67 million. The 2017 results of operations since the date of acquisition were not material.

Significant transactions in 2016

Alcon – acquisition of Transcend Medical, Inc.

On February 17, 2016, Alcon entered into an agreement to acquire Transcend Medical, Inc. (Transcend), a privately held, US-based company focused on developing minimally invasive surgical devices to treat glaucoma. The transaction closed on March 23, 2016, and the fair value of the total purchase consideration was USD 332

million. The amount consisted of an initial cash payment of USD 240 million and the net present value of contingent consideration of USD 92 million due to the Transcend shareholders, which they are eligible to receive upon the achievement of specified development and commercialization milestones. The purchase price allocation resulted in net identifiable assets of USD 294 million and goodwill of USD 38 million. The 2016 results of operations since the date of acquisition were not material.

Innovative Medicines – acquisition of Reprixys Pharmaceuticals Corporation

On November 18, 2016, Novartis acquired Reprixys Pharmaceuticals Corporation (Reprixys), a privately held, US-based company specializing in the development of therapeutics in certain hematologic and inflammatory disorders, following receipt of results of the SUSTAIN study. The previously held interest of 19% is adjusted to its fair value of USD 64 million through the consolidated income statement at acquisition date. This remeasurement resulted in a gain of USD 53 million.

The fair value of the total purchase consideration for acquiring the 81% stake Novartis did not already own amounted to USD 268 million. The amount consisted of an initial cash payment of USD 194 million and the net present value of the contingent consideration of USD 74 million due to Reprixys shareholders, which they are eligible to receive upon the achievement of specified development and commercialization milestones. The purchase price allocation resulted in net identifiable assets of USD 332 million. No goodwill was recognized. The 2016 results of operations since the date of acquisition were not material.

3. Segmentation of key figures 2018, 2017 and 2016

The businesses of Novartis are divided operationally on a worldwide basis into three identified reporting segments: Innovative Medicines, Sandoz and Alcon. In addition, we separately report Corporate activities.

Reporting segments are presented in a manner consistent with the internal reporting to the chief operating decision-maker, which is the Executive Committee of Novartis. The reporting segments are managed separately because they each research, develop, manufacture, distribute and sell distinct products that require differing marketing strategies.

The Executive Committee of Novartis is responsible for allocating resources and assessing the performance of the reporting segments.

Effective January 1, 2018, following an internal reorganization, the reporting of the financial results of the reporting segments Innovative Medicines and Alcon have been adapted. The restatements reflect, in all years presented, the transfer of the Innovative Medicine Division ophthalmic over-the-counter products together with a small portfolio of surgical diagnostics products to the Alcon Division. In the prior year, the Alcon brand name intangible asset was reported in Corporate, as it was used to market products of the Alcon Division and products within the Ophthalmology business franchise of the Innovative Medicines Division. In connection with the planned spin-off of the Alcon Division (see Note 30), it is the intention of the Group to transfer the full rights of the Alcon brand name to the Alcon Division. As a result, the Innovative Medicines Division started the process to rebrand the products within its Ophthalmology business franchise and will no longer use the Alcon brand name. As a result, the Alcon brand name intangible asset is reported in the Alcon Division. To comply with IFRS, Novartis has restated its consolidated income statement and balance sheet disclosures by segment to reflect the internal reorganization and the reclassification of the Alcon brand name. This restatement had no impact on the reported financial results of the Sandoz Division or the total Group.

Innovative Medicines researches, develops, manufactures, distributes and sells patented prescription medicines. The Innovative Medicines Division is organized into two global business units: Novartis Oncology and Novartis Pharmaceuticals. Novartis Oncology consists of the global business franchise Oncology, and Novartis Pharmaceuticals consists of the global business franchises Ophthalmology; Neuroscience; Immunology, Hepatology and Dermatology; Respiratory; Cardio-Metabolic; and Established Medicines.

Sandoz develops, manufactures and markets finished dosage form medicines as well as intermediary products including active pharmaceutical ingredients. Sandoz is organized globally into three franchises: Retail Generics, Anti-Infectives and Biopharmaceuticals. In Retail Generics, Sandoz develops, manufactures and markets active ingredients and finished dosage forms of pharmaceuticals to third parties. Retail Generics includes the areas of cardiovascular, central nervous system, dermatology, gastrointestinal and hormonal therapies, metabolism, oncology, ophthalmics, pain and respiratory, as well as finished dosage form anti-infectives sold to third parties. In Anti-Infectives, Sandoz manufactures and supplies active pharmaceutical ingredients and intermediates, mainly

antibiotics, for internal use by Retail Generics and for sale to third-party customers. In Biopharmaceuticals, Sandoz develops, manufactures and markets protein- or other biotechnology-based products, including biosimilars, and provides biotechnology manufacturing services to other companies.

Alcon researches, discovers, develops, manufactures, distributes and sells a broad range of eye care products. Alcon is the leading eye care devices company globally. Alcon is organized into two global business franchises: Surgical and Vision Care. Surgical researches, develops, manufactures, distributes and sells ophthal-

mic products for cataract surgery, vitreoretinal surgery, refractive laser surgery and glaucoma surgery. The Surgical portfolio also includes implantables, consumables and surgical equipment required for these procedures and supports the end-to-end procedure needs of the ophthalmic surgeon. Vision Care researches, develops, manufactures, distributes and sells daily disposable, reusable, and color-enhancing contact lenses and a comprehensive portfolio of ocular health products, including products for dry eye, contact lens care and ocular allergies, as well as ocular vitamins and redness relievers. Alcon also provides services, training, education and technical support for both the Surgical and Vision Care businesses.

Income and expenses relating to Corporate include the costs of the Group headquarters and those of corporate coordination functions in major countries. In addition, Corporate includes other items of income and expense that are not attributable to specific segments, such as certain revenues from intellectual property rights, certain expenses related to post-employment benefits, environmental remediation liabilities, charitable activities, donations and sponsorships. Usually, no allocation of Corporate items is made to the segments. As a result, Corporate assets and liabilities principally consist of net liquidity (cash and cash equivalents, marketable securities less financial debts), investments in associated companies and current and deferred taxes and non-segment-specific environmental remediation and post-employment benefit liabilities.

Our divisions are supported by the Novartis Institutes for BioMedical Research, Global Drug Development, Novartis Technical Operations and Novartis Business Services organizations.

• The Novartis Institutes for BioMedical Research (NIBR) conducts research activities for the Innovative Medicines Division and also collaborates with Sandoz.

• The Global Drug Development organization was established in July 2016 and oversees all drug development activities for our Innovative Medicines Division and the biosimilars portfolio of our Sandoz Division.

• The Novartis Technical Operations organization was established in July 2016, to centralize management of our manufacturing operations across our Innovative Medicines and Sandoz Divisions.

• Novartis Business Services (NBS) was established in January 2015 as a shared services organization and delivers business support services across the Group, such as information technology, real estate and facility services, procurement, product lifecycle services, human resources, and financial reporting and accounting operations.

The accounting policies mentioned in Note 1 are used in the reporting of segment results. Inter-segmental sales are made at amounts that are considered to approximate arm’s length transactions. The Executive Committee of Novartis evaluates segmental performance and allocates resources among the segments based on a number of measures including net sales, operating income and net operating assets. Segment net operating assets consist primarily of property, plant and equipment; intangible assets; goodwill; inventories; and trade and other operating receivables less operating liabilities.

Segmentation – consolidated income statements

	Innovative Medicines		Sandoz		Alcon		Corporate (including eliminations)		Group	
(USD millions)	2018	2017 restated [1]	2018	2017	2018	2017 restated [1]	2018	2017	2018	2017
Net sales to third parties	34 892	32 278	9 859	10 060	7 149	6 771			51 900	49 109
Sales to other segments	741	668	177	118	4	3	– 922	– 789		
Net sales	35 633	32 946	10 036	10 178	7 153	6 774	– 922	– 789	51 900	49 109
Other revenues	1 188	898	62	37		3	16	88	1 266	1 026
Cost of goods sold	– 9 870	– 8 650	– 5 530	– 5 800	– 3 983	– 3 588	976	863	– 18 407	– 17 175
Gross profit	26 951	25 194	4 568	4 415	3 170	3 189	70	162	34 759	32 960
Selling, general and administration	– 10 907	– 9 887	– 2 305	– 2 126	– 2 754	– 2 532	– 505	– 452	– 16 471	– 14 997
Research and development	– 7 675	– 7 615	– 814	– 774	– 585	– 583			– 9 074	– 8 972
Other income	977	1 027	505	204	58	47	150	691	1 690	1 969
Other expense	– 1 475	– 1 124	– 622	– 351	– 83	– 124	– 555	– 732	– 2 735	– 2 331
Operating income	7 871	7 595	1 332	1 368	– 194	– 3	– 840	– 331	8 169	8 629
Income from associated companies	1	– 1	5	23			6 432	1 086	6 438	1 108
Interest expense									– 957	– 777
Other financial income and expense									185	39
Income before taxes									13 835	8 999
Taxes									– 1 221	– 1 296
Net income									12 614	7 703
Attributable to:										
Shareholders of Novartis AG									12 611	7 703
Non-controlling interests									3	0
Included in net income are:										
Interest income									294	110
Depreciation of property, plant and equipment	– 1 075	– 916	– 285	– 270	– 235	– 217	– 122	– 117	– 1 717	– 1 520
Amortization of intangible assets	– 2 214	– 2 167	– 366	– 447	– 1 052	– 1 066	– 7	– 10	– 3 639	– 3 690
Impairment charges on property, plant and equipment, net	– 239	– 84	– 60	– 73	– 3		– 2		– 304	– 157
Impairment charges on intangible assets, net	– 592	– 591	– 249	– 61	– 391	– 57			– 1 232	– 709
Impairment charges and fair value gains on financial assets, net	107	– 42			17	– 29	– 113	– 185	11	– 256
Additions to restructuring provisions	– 395	– 122	– 32	– 61	– 13	– 8	– 94	– 3	– 534	– 194
Equity-based compensation of Novartis equity plans	– 645	– 593	– 53	– 52	– 93	– 71	– 220	– 208	– 1 011	– 924

[1] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018

	Innovative Medicines		Sandoz		Alcon		Corporate (including eliminations)		Group	
(USD millions)	2017 restated [1]	2016 restated [1]	2017	2016	2017 restated [1]	2016 restated [1]	2017	2016	2017	2016
Net sales to third parties	32 278	31 831	10 060	10 144	6 771	6 543			49 109	48 518
Sales to other segments	668	624	118	104	3		– 789	– 728		
Net sales	32 946	32 455	10 178	10 248	6 774	6 543	– 789	– 728	49 109	48 518
Other revenues	898	815	37	37	3	4	88	62	1 026	918
Cost of goods sold	– 8 650	– 8 976	– 5 800	– 5 971	– 3 588	– 3 447	863	874	– 17 175	– 17 520
Gross profit	25 194	24 294	4 415	4 314	3 189	3 100	162	208	32 960	31 916
Selling, general and administration	– 9 887	– 9 225	– 2 126	– 1 981	– 2 532	– 2 480	– 452	– 506	– 14 997	– 14 192
Research and development	– 7 615	– 7 696	– 774	– 814	– 583	– 529			– 8 972	– 9 039
Other income	1 027	1 091	204	185	47	48	691	603	1 969	1 927
Other expense	– 1 124	– 1 209	– 351	– 259	– 124	– 100	– 732	– 776	– 2 331	– 2 344
Operating income	7 595	7 255	1 368	1 445	– 3	39	– 331	– 471	8 629	8 268
Income from associated companies	– 1		23	6			1 086	697	1 108	703
Interest expense									– 777	– 707
Other financial income and expense									39	– 447
Income before taxes									8 999	7 817
Taxes									– 1 296	– 1 119
Net income									7 703	6 698
Attributable to:										
Shareholders of Novartis AG									7 703	6 712
Non-controlling interests									0	– 14
Included in net income are:										
Interest income									110	43
Depreciation of property, plant and equipment	– 916	– 883	– 270	– 260	– 217	– 229	– 117	– 117	– 1 520	– 1 489
Amortization of intangible assets	– 2 167	– 2 346	– 447	– 450	– 1 066	– 1 053	– 10	– 12	– 3 690	– 3 861
Impairment charges on property, plant and equipment, net	– 84	– 93	– 73	– 2		– 5		– 2	– 157	– 102
Impairment charges on intangible assets, net	– 591	– 524	– 61	– 65	– 57	– 2			– 709	– 591
Impairment charges and fair value gains on financial assets, net	– 42	– 55			– 29		– 185	– 77	– 256	– 132
Additions to restructuring provisions	– 122	– 236	– 61	– 46	– 8	– 36	– 3	– 25	– 194	– 343
Equity-based compensation of Novartis	– 593	– 582	– 52	– 47	– 71	– 53	– 208	– 164	– 924	– 846

equity plans

[1] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018

Segmentation – consolidated balance sheets

	Innovative Medicines		Sandoz		Alcon		Corporate (including eliminations)		Group	
(USD millions)	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017
Total assets [1]	67 055	52 657	17 328	18 231	25 971	26 412	35 209	35 779	145 563	133 079
Total liabilities	– 13 056	– 11 457	– 3 377	– 3 459	– 1 964	– 1 893	– 48 474	– 42 043	– 66 871	– 58 852
Total equity									78 692	74 227
Net debt									16 184	19 047
Net operating assets	53 999	41 200	13 951	14 772	24 007	24 519			94 876	93 274
Included in assets and liabilities are:										
Total property, plant and equipment	10 098	10 857	2 159	2 525	2 878	2 403	561	679	15 696	16 464
Additions to property, plant and equipment [2]	822	877	294	326	519	431	139	94	1 774	1 728
Total goodwill and intangible assets [1]	44 593	30 154	9 712	10 993	19 578	20 573	130	27	74 013	61 747
Additions to goodwill and intangible assets [2]	1 265	984	107	64	196	82	24	16	1 592	1 146
Total investment in associated companies	81	41	7	7			8 264	15 322	8 352	15 370
Additions to investment in associated companies	18	6					11	40	29	46
Cash and cash equivalents, marketable securities, commodities, time deposits and derivative financial instruments							15 964	9 485	15 964	9 485
Financial debts and derivative financial instruments							32 148	28 532	32 148	28 532
Current income tax and deferred tax liabilities							9 513	6 891	9 513	6 891

[1] 2017 restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018, and the Alcon brand name reclassification from Corporate to the Alcon Division. These restatements had no impact on Sandoz or the total Group.

[2] Excluding the impact of business combinations

The following table shows countries that accounted for more than 5% of at least one of the respective Group totals, as well as regional information for net sales for the years ended December 31, 2018, 2017 and 2016, and for selected non-current assets for the years ended December 31, 2018 and 2017:

	Net sales[1]						Total of selected non-current assets[2]			
(USD millions)	2018	%	2017	%	2016	%	2018	%	2017	%
Country										

Switzerland	852	2	836	2	830	2	41 972	43	43 920	47
United States	17 560	34	16 935	34	17 117	35	39 082	40	28 476	30
France	2 705	5	2 490	5	2 390	5	3 976	4	284	
Germany	4 184	8	3 690	8	3 634	7	3 124	3	3 128	3
United Kingdom	1 261	2	1 160	2	1 182	2	758	1	7 957	9
Japan	3 169	6	3 177	6	3 267	7	144		148	
Other	22 169	43	20 821	43	20 098	42	9 005	9	9 668	11
Group	51 900	100	49 109	100	48 518	100	98 061	100	93 581	100
Region										
Europe	19 064	37	17 492	36	17 079	35	55 913	57	61 699	66
Americas	21 595	41	20 899	42	20 998	43	39 082	40	29 113	31
Asia/Africa/Australasia	11 241	22	10 718	22	10 441	22	3 066	3	2 769	3
Group	51 900	100	49 109	100	48 518	100	98 061	100	93 581	100

[1] Net sales from operations by location of third-party customer

[2] Total of property, plant and equipment; goodwill; intangible assets; and investment in associated companies

The Group’s largest, second-largest and third-largest customers account for approximately 16%, 13% and 7% of net sales, respectively (2017: 17%, 12% and 7%, respectively; 2016: 16%, 12% and 6%, respectively). All segments had sales to these customers in 2018, 2017 and

2016. No other customer accounted for 5% or more of net sales in any year.
The highest amounts of trade receivables outstanding were for these same three customers and amounted to 12%, 10% and 6%, respectively, of the trade receivables at December 31, 2018 (2017: 14%, 9% and 5%, respectively).
Segmentation – net sales by region1

	2018 USD m	2017 restated USD m [2]	Change (2017 to 2018) USD %	2016 restated USD m [2]	Change (2016 to 2017) USD %
Innovative Medicines					
Europe	12 296	11 127	11	11 041	1
US	11 864	10 857	9	10 644	2
Asia/Africa/Australasia	8 097	7 702	5	7 540	2
Canada and Latin America	2 635	2 592	2	2 606	– 1
Total	34 892	32 278	8	31 831	1
Of which in Established Markets	26 258	24 174	9	23 954	1
Of which in Emerging Growth Markets	8 634	8 104	7	7 877	3
Sandoz					
Europe	4 963	4 633	7	4 354	6
US	2 754	3 278	– 16	3 708	– 12
Asia/Africa/Australasia	1 363	1 391	– 2	1 418	– 2
Canada and Latin America	779	758	3	664	14
Total	9 859	10 060	– 2	10 144	– 1
Of which in Established Markets	7 233	7 383	– 2	7 580	– 3
Of which in Emerging Growth Markets	2 626	2 677	– 2	2 564	4
Alcon					
Europe	1 805	1 732	4	1 684	3
US	2 942	2 800	5	2 765	1
Asia/Africa/Australasia	1 781	1 625	10	1 483	10
Canada and Latin America	621	614	1	611	0
Total	7 149	6 771	6	6 543	3
Of which in Established Markets	5 395	5 153	5	5 092	1
Of which in Emerging Growth Markets	1 754	1 618	8	1 451	12
Group					
Europe	19 064	17 492	9	17 079	2
US	17 560	16 935	4	17 117	– 1
Asia/Africa/Australasia	11 241	10 718	5	10 441	3
Canada and Latin America	4 035	3 964	2	3 881	2
Total	51 900	49 109	6	48 518	1
Of which in Established Markets	38 886	36 710	6	36 626	0
Of which in Emerging Growth Markets	13 014	12 399	5	11 892	4

[1] Net sales from operations by location of third-party customer. Emerging Growth Markets comprise all markets other than the Established Markets of the US, Canada, Western Europe, Japan, Australia and New Zealand.
[2] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018. This restatement had no impact on Sandoz or the total Group.

Innovative Medicines net sales by business franchise

	2018 USD millions	2017 restated USD millions [1]	Change (2017 to 2018) USD %	2016 restated USD millions [1]	Change (2016 to 2017) USD %
Oncology					
Tasigna	1 874	1 841	2	1 739	6
Sandostatin	1 587	1 612	– 2	1 646	– 2
Gleevec/Glivec	1 561	1 943	– 20	3 323	– 42
Afinitor/Votubia	1 556	1 525	2	1 516	1
Promacta/Revolade	1 174	867	35	635	37
Tafinlar + Mekinist	1 155	873	32	672	30
Exjade/Jadenu	1 099	1 059	4	956	11
Jakavi	977	777	26	581	34
Votrient	828	808	2	729	11
Kisqali	235	76	209	0	nm
Lutathera	167	0	nm	0	nm
Kymriah	76	6	nm	0	nm
Other	1 139	887	28	993	– 11
Total Oncology business unit	13 428	12 274	9	12 790	– 4
Ophthalmology					
Lucentis	2 046	1 888	8	1 835	3
Travoprost Group	517	589	– 12	619	– 5
Topical Olopatadine Group	247	284	– 13	335	– 15
Other	1 748	1 860	– 6	1 944	– 4
Total Ophthalmology	4 558	4 621	– 1	4 733	– 2
Neuroscience					
Gilenya	3 341	3 185	5	3 109	2
Other	88	102	– 14	124	– 18
Total Neuroscience	3 429	3 287	4	3 233	2
Immunology, Hepatology and Dermatology					
Cosentyx	2 837	2 071	37	1 128	84
Ilaris	554	402	38	283	42
Other	1	1	0	1	0
Total Immunology, Hepatology and Dermatology	3 392	2 474	37	1 412	75

	2018 USD millions	2017 restated USD millions [1]	Change (2017 to 2018) USD %	2016 restated USD millions [1]	Change (2016 to 2017) USD %
Respiratory					
Ultibro Breezhaler	454	411	10	363	13
Seebri Breezhaler	148	151	– 2	149	1
Onbrez Breezhaler	101	112	– 10	143	– 22
Subtotal COPD[2] portfolio	703	674	4	655	3
Xolair [3]	1 039	920	13	835	10

Other	25	23	9	31	– 26
Total Respiratory	1 767	1 617	9	1 521	6
Cardio-Metabolic					
Entresto	1 028	507	103	170	198
Other	22	17	29	14	21
Total Cardio-Metabolic	1 050	524	100	184	185
Established Medicines					
Galvus Group	1 284	1 233	4	1 193	3
Diovan Group	1 023	957	7	1 073	– 11
Exforge Group	1 002	960	4	926	4
Zortress/Certican	464	414	12	398	4
Neoral/Sandimmun(e)	463	488	– 5	515	– 5
Voltaren/Cataflam	445	465	– 4	525	– 11
Other	2 587	2 964	– 13	3 328	– 11
Total Established Medicines	7 268	7 481	– 3	7 958	– 6
Total Pharmaceutical business unit	21 464	20 004	7	19 041	5
Total division net sales	34 892	32 278	8	31 831	1

[1] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018
[2] Chronic obstructive pulmonary disease
[3] Net sales reflect *Xolair* sales for all indications (e.g., including *Xolair* SAA and *Xolair* CSU, which is managed by the Immunology, Hepatology and Dermatology franchise).

nm = not meaningful

Top 20 Innovative Medicines Division product net sales – 2018

Brands	Business franchise	Indication	US USD m	Rest of world USD m	Total USD m
Gilenya	Neuroscience	Relapsing multiple sclerosis	1 765	1 576	3 341
Cosentyx	Immunology, Hepatology and Dermatology	Psoriasis, ankylosing spondylitis and psoriatic arthritis	1 674	1 163	2 837
Lucentis	Ophthalmology	Age-related macular degeneration		2 046	2 046
Tasigna	Oncology	Chronic myeloid leukemia	806	1 068	1 874
Sandostatin	Oncology	Carcinoid tumors and acromegaly	817	770	1 587
Gleevec/Glivec	Oncology	Chronic myeloid leukemia and GIST	440	1 121	1 561
Afinitor/Votubia	Oncology	Breast cancer/TSC	929	627	1 556
Galvus Group	Established Medicines	Diabetes		1 284	1 284
Promacta/Revolade	Oncology	Immune thrombocytopenic purpura	581	593	1 174
Tafinlar + Mekinist	Oncology	Melanoma	457	698	1 155
Exjade/Jadenu	Oncology	Chronic iron overload	521	578	1 099
Xolair [1]	Respiratory	Asthma		1 039	1 039
Entresto	Cardio-Metabolic	Chronic heart failure	556	472	1 028
Diovan Group	Established Medicines	Hypertension	84	939	1 023
Exforge Group	Established Medicines	Hypertension	19	983	1 002
Jakavi	Oncology	Myelofibrosis		977	977
Votrient	Oncology	Renal cell carcinoma	404	424	828
Ilaris	Immunology, Hepatology and Dermatology	Auto-inflammatory (CAPS, TRAPS, HIDS/MKD, FMF, SJIA, AOSD and gout)	262	292	554
Travoprost Group	Ophthalmology	Reduction of elevated intraocular pressure	194	323	517
Zortress/Certican	Established Medicines	Transplantation	145	319	464
Top 20 products total			9 654	17 292	26 946
Rest of portfolio			2 210	5 736	7 946
Total division sales			11 864	23 028	34 892

[1] Net sales reflect *Xolair* sales for all indications (e.g., including *Xolair* SAA and *Xolair* CSU, which are managed by the Immunology, Hepatology and Dermatology franchise).

Top 20 Innovative Medicines Division product net sales – 2017

Brands	Business franchise	Indication	US USD m	Rest of world USD m	Total USD m
Gilenya	Neuroscience	Relapsing multiple sclerosis	1 709	1 476	3 185
Cosentyx	Immunology, Hepatology and Dermatology	Psoriasis, ankylosing spondylitis and psoriatic arthritis	1 275	796	2 071
Gleevec/Glivec	Oncology	Chronic myeloid leukemia and GIST	627	1 316	1 943
Lucentis	Ophthalmology	Age-related macular degeneration		1 888	1 888
Tasigna	Oncology	Chronic myeloid leukemia	810	1 031	1 841
Sandostatin	Oncology	Carcinoid tumors and acromegaly	832	780	1 612
Afinitor/Votubia	Oncology	Breast cancer/TSC	819	706	1 525
Galvus Group	Cardio-Metabolic	Diabetes		1 233	1 233
Exjade/Jadenu	Oncology	Chronic iron overload	515	544	1 059
Exforge Group	Established Medicines	Hypertension	28	932	960
Diovan Group	Established Medicines	Hypertension	87	870	957
Xolair [1]	Respiratory	Asthma		920	920
Tafinlar + Mekinist	Oncology	Melanoma	339	534	873
Promacta/Revolade	Oncology	Immune thrombocytopenic purpura	446	421	867
Votrient	Oncology	Renal cell carcinoma	407	401	808
Jakavi	Oncology	Myelofibrosis		777	777
Travoprost Group	Ophthalmology	Reduction of elevated intraocular pressure	216	373	589
Entresto	Cardio-Metabolic	Chronic heart failure	297	210	507
Neoral/Sandimmun(e)	Immunology, Hepatology and Dermatology	Transplantation	38	450	488
Voltaren/Cataflam	Established Medicines	Inflammation/pain		465	465
Top 20 products total			8 445	16 123	24 568
Rest of portfolio[2]			2 412	5 298	7 710
Total division sales[2]			10 857	21 421	32 278

[1] Net sales reflect *Xolair* sales for all indications (e.g., including *Xolair* SAA and *Xolair* CSU, which are managed by the Immunology, Hepatology and Dermatology franchise).

[2] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018

Top 20 Innovative Medicines Division product net sales – 2016

Brands	Business franchise	Indication	US USD m	Rest of world USD m	Total USD m
Gleevec/Glivec	Oncology	Chronic myeloid leukemia and GIST	1 214	2 109	3 323
Gilenya	Neuroscience	Relapsing multiple sclerosis	1 683	1 426	3 109
Lucentis	Ophthalmology	Age-related macular degeneration		1 835	1 835
Tasigna	Oncology	Chronic myeloid leukemia	722	1 017	1 739
Sandostatin	Oncology	Carcinoid tumors and acromegaly	853	793	1 646
Afinitor/Votubia	Oncology	Breast cancer/TSC	775	741	1 516
Galvus Group	Cardio-Metabolic	Diabetes		1 193	1 193
Cosentyx	Immunology, Hepatology and Dermatology	Psoriasis, ankylosing spondylitis and psoriatic arthritis	765	363	1 128
Diovan Group	Established Medicines	Hypertension	147	926	1 073
Exjade/Jadenu	Oncology	Chronic iron overload	447	509	956
Exforge Group	Established Medicines	Hypertension	10	916	926
Xolair [1]	Respiratory	Asthma		835	835
Votrient	Oncology	Renal cell carcinoma	357	372	729
Tafinlar + Mekinist	Oncology	Melanoma	298	374	672
Promacta/Revolade	Oncology	Immune thrombocytopenic purpura	310	325	635
Travoprost Group	Ophthalmology	Reduction of elevated intraocular pressure	211	408	619
Jakavi	Oncology	Myelofibrosis		581	581
Voltaren/Cataflam	Established Medicines	Inflammation/pain		525	525
Neoral/Sandimmun(e)	Immunology, Hepatology and Dermatology	Transplantation	41	474	515
Exelon/Exelon Patch	Established Medicines	Alzheimer's disease	90	354	444
Top 20 products total			7 923	16 076	23 999
Rest of portfolio[2]			2 721	5 111	7 832
Total division sales[2]			10 644	21 187	31 831

[1] Net sales reflect *Xolair* sales for all indications (e.g., including *Xolair* SAA and *Xolair* CSU, which is managed by the Immunology, Hepatology and Dermatology franchise).

[2] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018

Sandoz net sales by business franchise

	2018 USD m	2017 USD m	Change (2017 to 2018) USD %	2016 USD m	Change (2016 to 2017) USD %
Retail Generics [1]	7 880	8 409	– 6	8 623	– 2
Biopharmaceuticals	1 436	1 135	27	1 002	13
Anti-Infectives	543	516	5	519	– 1
Total division net sales	9 859	10 060	– 2	10 144	– 1

[1] Of which USD 826 million (2017: USD 880 million) represents anti-infectives sold under the Sandoz name

Alcon net sales by business franchise

	2018 USD m	2017 restated USD m [1]	Change (2017 to 2018) USD %	2016 restated USD m [1]	Change (2016 to 2017) USD %
Surgical					
Consumables	2 227	2 097	6	2 007	4
Implantables	1 136	1 034	10	1 007	3
Equipment/other	636	594	7	565	5
Total Surgical	3 999	3 725	7	3 579	4
Vision Care					
Contact lenses	1 928	1 833	5	1 762	4
Ocular health	1 222	1 213	1	1 202	1
Total Vision Care	3 150	3 046	3	2 964	3
Total division net sales	7 149	6 771	6	6 543	3

[1] Restated to reflect the product transfers between the Innovative Medicines and Alcon Divisions that was effective as of January 1, 2018

The product portfolio of Sandoz and Alcon is widely spread in 2018, 2017 and 2016.

Segmentation – other revenue

	Innovative Medicines		Sandoz		Alcon		Corporate (including eliminations)		Group	
(USD millions)	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017
Profit-sharing income	874	648	3	4					877	652
Royalty income	162	186	10	24		3	16	88	188	301
Milestone income	128	28	45						173	28
Other [1]	24	36	4	9					28	45
Total other revenues	1 188	898	62	37		3	16	88	1 266	1 026

[1] Other includes revenue from activities such as manufacturing or other services rendered, to the extent such revenue is not recorded under net sales.

	Innovative Medicines		Sandoz		Alcon		Corporate (including eliminations)		Group	
(USD millions)	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016
Profit-sharing income	648	558	4	6					652	564
Royalty income	186	167	24	24	3	4	88	62	301	257

Milestone income	28	65							28	65
Other [1]	36	25	9	7					45	32
Total other revenues	898	815	37	37	3	4	88	62	1 026	918

[1] Other includes revenue from activities such as manufacturing or other services rendered, to the extent such revenue is not recorded under net sales.

4. Associated companies

	Net income statement effect			Other comprehensive income effect [1]			Total comprehensive income effect		
(USD millions)	2018	2017	2016	2018	2017	2016	2018	2017	2016
Roche Holding AG, Switzerland	526	456	464	75	108	– 39	601	564	425
GlaxoSmithKline Consumer Healthcare Holdings Ltd., UK	5 910	629	234	– 557	– 145	710	5 353	484	944
Others	2	23	5				2	23	5
Associated companies related to continuing operations	6 438	1 108	703	– 482	– 37	671	5 956	1 071	1 374

[1] In 2018, Novartis share of other comprehensive income recognized by associated companies, net of taxes of USD 511 million was recycled into the consolidated income statement as a result of the divestment of the investment in GSK Consumer Healthcare Holdings Ltd. No Novartis share of other comprehensive income recognized by associated companies, net of taxes was recycled into the consolidated income statement in 2017 and 2016.

Novartis has significant investments in Roche Holding AG, Basel (Roche) as well as certain other smaller investments that are accounted for as associated companies. The investment in GlaxoSmithKline Consumer Healthcare Holdings Ltd, Brentford, Middlesex, UK, was divested on June 1, 2018, to GlaxoSmithKline plc, Great Britain.

	Balance sheet value	
(USD millions)	December 31, 2018	December 31, 2017
Roche Holding AG, Switzerland	8 195	8 121
GlaxoSmithKline Consumer Healthcare Holdings Ltd., UK		7 020
Others	157	229
Total	8 352	15 370

Roche Holding AG

The Group’s holding in Roche voting shares was 33.3% at December 31, 2018, 2017 and 2016. This investment represents approximately 6.2% of Roche’s total outstanding voting and non-voting equity instruments at December 31, 2018, 2017 and 2016.

Since full-year 2018 financial data for Roche is not available when Novartis produces its consolidated financial results, a survey of analyst estimates is used to estimate the Group’s share of Roche’s net income. Any differences between these estimates and actual results will be adjusted in the Group’s 2019 consolidated financial statements when available.

The following tables show summarized financial information for Roche, including current values of fair value adjustments made at the time of the acquisition of the shares, for the year ended December 31, 2017, and for the six months ended June 30, 2018 (since full-year 2018 data is not yet available):

(CHF billions)	Current assets	Non-current assets	Current liabilities	Non-current liabilities
December 31, 2017	31.6	55.4	22.2	25.5
June 30, 2018	29.6	57.8	23.0	25.0

(CHF billions)	Revenue	Net income	Other comprehen-sive income	Total comprehen-sive income
December 31, 2017	53.3	6.6	0.7	7.3
June 30, 2018	28.1	6.4	0.8	7.2

A purchase price allocation was performed on the basis of publicly available information at the time of acquisition of the investment. The December 31, 2018, balance sheet value allocation is as follows:

(USD millions)	December 31, 2018
Novartis share of Roche’s estimated net assets	2 466
Novartis share of re-appraised intangible assets	521
Implicit Novartis goodwill	2 887
Current value of share in net identifiable assets and goodwill	5 874
Accumulated equity accounting adjustments and translation effects less dividends received	2 321
Balance sheet value	8 195

The identified intangible assets principally relate to the value of currently marketed products and are amortized on a straight-line basis over their estimated average useful life of 20 years.

In 2018, dividends received from Roche in relation to the distribution of its 2017 net income amounted to USD 464 million (2017: USD 438 million in relation to the distribution of its 2016 net income).

The consolidated income statement effects from applying Novartis accounting principles for this investment in 2018, 2017 and 2016 are as follows:

(USD millions)	2018	2017	2016
Novartis share of Roche's estimated current-year consolidated net income	799	669	678
Prior-year adjustment	– 125	– 67	– 68
Amortization of fair value adjustments relating to intangible assets, net of taxes of USD 40 million (2017: USD 42 million; 2016: USD 42 million)	– 148	– 146	– 146
Net income effect	526	456	464

The publicly quoted market value of the Novartis interest in Roche (SIX symbol: RO) at December 31, 2018, was USD 13.2 billion (2017: USD 13.4 billion).

GlaxoSmithKline Consumer Healthcare Holdings Ltd.

On March 27, 2018, Novartis entered into an agreement with GlaxoSmithKline plc, Great Britain (GSK) to divest its 36.5% stake in GSK Consumer Healthcare Holdings Ltd. (GSK Consumer Healthcare) to GSK for USD 13.0 billion in cash. As a result, Novartis discontinued the use of equity method accounting starting from April 1, 2018. The divestment transaction closed on June 1, 2018, and Novartis realized a pre-tax gain of USD 5.8 billion, recorded in income from associated companies. See Note 2.

GSK Consumer Healthcare was formed in March, 2015, via contribution of businesses from both Novartis and GSK. At December 31, 2017 and 2016, Novartis had a 36.5% interest in GSK Consumer Healthcare and had four of 11 seats on the GSK Consumer Healthcare board of directors. Furthermore, Novartis had customary minority rights and also exit rights at a pre-defined, market-based pricing mechanism.

In 2018, dividends received from GSK Consumer Healthcare amounted to USD 252 million (2017: USD 544 million).

The consolidated income statement effects from applying Novartis accounting principles for this investment in 2018, 2017 and 2016 are as follows:

(USD millions)	2018	2017	2016
Novartis share of GSK Consumer Healthcare's estimated current-year consolidated net income	119	589	268
Prior-year adjustment	4	47	– 22
Amortization of fair value adjustments relating to intangible assets and inventory, net of taxes of USD 1 million (2017: USD 1 million; 2016: USD 2 million)	– 3	– 7	– 12
Pre-tax gain on divestment of GSK Consumer Healthcare	5 790		
Net income effect	5 910	629	234

5. Interest expense and other financial income and expense

Interest expense

(USD millions)	2018	2017	2016
Interest expense	– 892	– 758	– 709
(Expense)/ income arising from discounting long-term liabilities	– 65	– 19	2
Total interest expense	– 957	– 777	– 707

Other financial income and expense

(USD millions)	2018	2017	2016
Interest income	294	110	43
Dividend income	1	1	1
Net capital losses on available-for-sale securities		– 1	– 1
Impairment of commodities and available-for-sale securities, net	– 2	12	7
Other financial expense	– 33	– 25	– 20
Monetary loss from hyperinflation accounting	– 10		
Currency result, net	– 65	– 58	– 477
Total other financial income and expense	185	39	– 447

6. Taxes

Income before taxes

(USD millions)	2018	2017	2016
Switzerland	11 686	5 289	3 110
Foreign	2 149	3 710	4 707
Total income before taxes	13 835	8 999	7 817

Current and deferred income tax expense

(USD millions)	2018	2017	2016
Switzerland	– 671	– 462	– 709
Foreign	– 1 132	– 1 594	– 1 418
Current income tax expense	– 1 803	– 2 056	– 2 127
Switzerland	23	– 298	765
Foreign	559	1 058	243
Deferred tax income	582	760	1 008
Total income tax expense	– 1 221	– 1 296	– 1 119

Analysis of tax rate

The main elements contributing to the difference between the Group's overall applicable tax rate (which can change each year since it is calculated as the weighted average tax rate based on the pre-tax income of each subsidiary) and the effective tax rate are:

(As a percentage)	2018	2017	2016
Applicable tax rate	14.0	14.5	13.2
Effect of disallowed expenditures	2.0	3.4	3.5
Effect of utilization of tax losses brought forward from prior periods	– 0.1	– 0.1	– 0.2
Effect of income taxed at reduced rates	– 0.4	– 0.2	– 0.2
Effect of income not subject to tax [1]	– 3.7	0.0	0.0
Effect of tax credits and allowances	– 2.4	– 2.2	– 2.8
Effect of release of contingent consideration liability	– 0.2	– 1.2	0.0
Effect of tax rate change on current and deferred tax assets and liabilities [2]	– 0.5	0.7	0.2
Effect of write-off of deferred tax assets	0.2	0.0	0.5
Effect of write down and reversal of write-down of investments in subsidiaries	– 0.1	– 1.1	– 1.0
Effect of tax benefits expiring in 2017	0.0	– 0.8	– 0.5
Effect of non-deductible losses in Venezuela	0.0	0.0	1.3
Effect of prior year items	– 0.6	1.2	0.2
Effect of other items [3]	0.6	0.2	0.1
Effective tax rate	8.8	14.4	14.3

[1] Included in 2018 is the effect of income not subject to tax (-3.7%) arising from the portion of the non-taxable gain on the divestment of the Group's investment in GSK Consumer Healthcare Holdings Ltd. attributable to Switzerland.

[2] Included in 2017 is a 0.7% impact related to the revaluation of the deferred tax assets and liabilities and a portion of current tax payables. This revaluation resulted from the US tax reform legislation enacted on December 22, 2017, refer to Note 11 for additional disclosures.

[3] In 2018, other items (+0.6%) include changes in uncertain tax positions (+1.0%) and other items (-0.4%). In 2016, other items (+0.1%) include one-time impacts for the deferred tax effects on the net assets of certain subsidiaries resulting from the change in their tax status (-6.2%), the changes in uncertain tax positions (+5.1%) and other items (+1.2%).

Novartis has a substantial business presence in many countries and is therefore subject to different income and expense items that are non-taxable (permanent differences) or taxed at different rates in those tax jurisdictions. This results in a difference between our applicable tax rate and effective tax rate, as shown in the table above.

The utilization of tax-loss carry-forwards lowered the tax charge by USD 19 million in 2018, by USD 7 million in 2017 and by USD 18 million in 2016.

7. Earnings per share

	2018	2017	2016
Net income attributable to shareholders of Novartis AG (USD millions)	12 611	7 703	6 712
Number of shares (in millions)			
Weighted average number of shares outstanding used in basic earnings per share	2 319	2 346	2 378
Adjustment for vesting of restricted shares, restricted share units and dilutive shares from options	25	25	22
Weighted average number of shares in diluted earnings per share	2 344	2 371	2 400
Basic earnings per share (USD)	5.44	3.28	2.82
Diluted earnings per share (USD)	5.38	3.25	2.80

Basic earnings per share (EPS) is calculated by dividing net income attributable to shareholders of Novartis AG by the weighted average number of shares outstanding in a reporting period. This calculation excludes the average number of issued shares purchased by the Group and held as treasury shares.

For diluted EPS, the weighted average number of shares outstanding is adjusted to assume the vesting of all restricted shares, restricted share units, and the conversion of all potentially dilutive shares arising from options on Novartis shares that have been issued.

No options were excluded from the calculation of diluted EPS in 2018, 2017 or 2016, as all options were dilutive in all years.

8. Changes in consolidated statements of comprehensive income

The consolidated statements of comprehensive income include the Group’s net income for the year as well as all other valuation adjustments recorded in the Group’s consolidated balance sheet but that under IFRS are not recorded in the consolidated income statement. These include fair value adjustments to financial instruments, actuarial gains or losses on defined benefit pension and other post-employment plans, and currency translation effects, net of tax.

The following table summarizes these value adjustments and currency translation effects attributable to Novartis shareholders:

(USD millions)	Fair value adjustments on marketable securities	Fair value adjustments on debt securities	Fair value adjustments on deferred cash flow hedges	Fair value adjustments on equity securities	Actuarial gains/(losses) from defined benefit plans	Cumulative currency translation effects	Total value adjustments
Value adjustments at January 1, 2016	462	– 1	– 18		– 5 413	747	– 4 223
Fair value adjustments on financial instruments	– 113		15				– 98
Net actuarial losses from defined benefit plans					– 514		– 514
Currency translation effects						– 2 389	– 2 389
Total value adjustments in 2016	– 113		15		– 514	– 2 389	– 3 001
Fair value adjustments related to divestments					12		12
Value adjustments at December 31, 2016	349	– 1	– 3		– 5 915	– 1 642	– 7 212
Fair value adjustments on financial instruments	39	– 1	12				50
Net investment hedge						– 237	– 237
Net actuarial losses from defined benefit plans					851		851
Currency translation effects						2 208	2 208
Total value adjustments in 2017	39	– 1	12		851	1 971	2 872
Value adjustments at December 31, 2017, as	388	– 2	9		– 5 064	329	– 4 340

previously reported							
Impact of adoption of IFRS 9 on retained earnings and OCI [1]	– 177						– 177
Reclassification to presentation required under IFRS 9	– 211			211			
Restated value adjustments at January 1, 2018		– 2	9	211	– 5 064	329	– 4 517
Fair value adjustments on financial instruments			12	13			25
Fair value adjustments on financial assets sold				– 16			– 16
Net investment hedge						95	95
Net actuarial gains from defined benefit plans					– 359		– 359
Currency translation effects						320	320
Total value adjustments in 2018			12	– 3	– 359	415	65
Value adjustments at December 31, 2018		– 2	21	208	– 5 423	744	– 4 452

[1] Notes 1 and 29 provide additional disclosures related to the impact of adoption of IFRS 9 Financial Instruments.
OCI: other comprehensive income

8.1) The 2018, 2017 and 2016 changes in the fair value of financial instruments were as follows:

(USD millions)	Fair value adjustments on marketable securities	Fair value adjustments on equity securities [1]	Fair value adjustments on debt securities	Fair value adjustments on deferred cash flow hedges	Total
Fair value adjustments at January 1, 2018, as previously reported	388		– 2	9	395
Impact of adoption of IFRS 9 on retained earnings	– 177				– 177

and other comprehensive income [2]					
Reclassification to presentation required under IFRS 9	– 211	211			
Restated fair value adjustments at January 1, 2018		211	– 2	9	218
Changes in fair value:					
– Equity securities		18			18
Amortized net losses on cash flow hedges transferred to the consolidated income statement				13	13
Deferred tax on above items		– 5		– 1	– 6
Realized net gains reclassified to the retained earnings:					
– Other financial assets sold		– 16			– 16
Fair value adjustments during the year		– 3		12	9
Fair value adjustments at December 31, 2018		208	– 2	21	227

[1] Includes fair value adjustments on equity securities designated as financial assets valued at fair value through other comprehensive income with no subsequent recycling into the consolidated income statement.
[2] Notes 1 and 29 provide aditional disclosures on impact of adoption of IFRS 9 Financial Instruments.

(USD millions)	Fair value adjustments on marketable securities	Fair value adjustments on debt securities	Fair value adjustments on deferred cash flow hedges	Total
Fair value adjustments at January 1, 2017	349	– 1	– 3	345
Changes in fair value:				
– Available-for-sale marketable securities	12	– 1		11
– Available-for-sale financial investments	47			47
Realized net gains transferred to the consolidated income statement:				
– Other financial assets sold	– 109			– 109
Amortized net losses on cash flow hedges transferred to the consolidated income statement			13	13
Impaired financial assets transferred to the consolidated income statement	102			102
Deferred tax on above items [1]	– 13		– 1	– 14
Fair value adjustments during the year	39	– 1	12	50
Fair value adjustments at December 31, 2017	388	– 2	9	395

[1] Included in 2017 is a USD 18 million impact related to the revaluation of deferred tax liabilities on available-for-sale financial investments held in the US that were previously recognized through other comprehensive income. This revaluation resulted from the US tax reform legislation enacted on December 22, 2017, refer to Note 11 for additional disclosures.

(USD millions)	Fair value adjustments on marketable securities	Fair value adjustments on debt securities	Fair value adjustments on deferred cash flow hedges	Total
Fair value adjustments at January 1, 2016	462	– 1	– 18	443
Changes in fair value:				
– Available-for-sale marketable securities	1			1
– Available-for-sale financial investments	– 87			– 87
Realized net gains transferred to the consolidated income statement:				
– Marketable securities sold	– 1			– 1
– Other financial assets sold	– 154			– 154
Amortized net losses on cash flow hedges transferred to the consolidated income statement			16	16
Impaired financial assets transferred to the consolidated income statement	131			131
Deferred tax on above items	– 3		– 1	– 4
Fair value adjustments during the year	– 113		15	– 98
Fair value adjustments at December 31, 2016	349	– 1	– 3	345

8.2) In 2018, cumulative currency translation losses of USD 946 million were recycled through the income statement as a result of the divestment of the investment in GSK Consumer Healthcare Holdings Ltd. See Notes 2 and 4. No currency translation losses or gains were recycled through the income statement in 2017 and 2016.

8.3) Remeasurements from defined benefit plans arise as follows:

(USD millions)	2018	2017	2016

Defined benefit pension plans before tax	– 482	1 367	– 667
Other post-employment benefit plans before tax	54	76	12
Taxation on above items [1]	69	– 592	140
Total after tax	– 359	851	– 515
Attributable to:			
Shareholders of Novartis AG	– 359	851	– 514
Non-controlling interests			– 1

[1] Included in 2017 is a USD -272 million impact related to the revaluation of deferred tax assets on US post-employment benefits that were previously recognized through other comprehensive income. This revaluation resulted from the US tax reform legislation enacted on December 22, 2017, refer to Note 11 for additional disclosures.

9. Property, plant and equipment

The following table summarizes the movements of property, plant and equipment during 2018:

(USD millions)	Land	Buildings	Construction in progress	Machinery and other equipment	Total
Cost					
January 1, 2018	720	14 064	2 368	16 858	34 010
Cost of assets related to disposal group held for sale [1]	– 11	– 114	– 24	– 160	– 309
Impact of business combinations	2	40	15	80	137
Reclassifications [2]	1	538	– 1 470	931	
Additions [3]	7	110	1 250	407	1 774
Disposals and derecognitions [4]	– 7	– 212	– 21	– 457	– 697
Currency translation effects	– 16	– 291	– 76	– 504	– 887
December 31, 2018	696	14 135	2 042	17 155	34 028
Accumulated depreciation					
January 1, 2018	– 40	– 5 983	– 38	– 11 485	– 17 546
Accumulated depreciation on assets related to disposal group held for sale [1]		56	4	101	161
Depreciation charge [5]	– 3	– 574		– 1 140	– 1 717
Accumulated depreciation on disposals and derecognitions [4]		180	3	412	595
Impairment charge	– 1	– 122	– 16	– 185	– 324
Reversal of impairment charge			8	12	20
Currency translation effects	1	115	2	361	479
December 31, 2018	– 43	– 6 328	– 37	– 11 924	– 18 332
Net book value at December 31, 2018	653	7 807	2 005	5 231	15 696
Net book value of property, plant and equipment under finance lease contracts		79			79
Commitments for purchases of property, plant and equipment					289
Capitalized borrowing costs					6

[1] Note 2 provides additional disclosures related to disposal group held for sale.

[2] Reclassifications between various asset categories due to completion of plant and other equipment under construction.

[3] Additions in the disposal group held for sale for the period from January 1, 2018, to the date of reclassification to assets held for sale were USD 21 million

[4] Derecognition of assets that are no longer used and are not considered to have a significant disposal value or other alternative use.

[5] Depreciation charge in the disposal group held for sale for the period from January 1, 2018, to the date of reclassification to assets held for sale was USD 15 million

The following table summarizes the movements of property, plant and equipment during 2017:

(USD millions)	Land	Buildings	Construction in progress	Machinery and other equipment	Total
Cost					
January 1, 2017	687	13 113	2 680	14 816	31 296
Reclassifications [1]	5	508	– 1 617	1 104	
Additions	13	104	1 186	425	1 728
Disposals and derecognitions [2]	– 23	– 324	– 71	– 593	– 1 011
Currency translation effects	38	663	190	1 106	1 997
December 31, 2017	720	14 064	2 368	16 858	34 010
Accumulated depreciation					
January 1, 2017	– 40	– 5 436	– 15	– 10 164	– 15 655
Depreciation charge	– 3	– 510		– 1 007	– 1 520
Accumulated depreciation on disposals and derecognitions [2]	6	275	34	534	849
Impairment charge		– 25	– 58	– 106	– 189
Reversal of impairment charge			2	30	32
Currency translation effects	– 3	– 287	– 1	– 772	– 1 063
December 31, 2017	– 40	– 5 983	– 38	– 11 485	– 17 546
Net book value at December 31, 2017	680	8 081	2 330	5 373	16 464
Net book value of property, plant and equipment under finance lease contracts		78			78
Commitments for purchases of property, plant and equipment					318
Capitalized borrowing costs					9

[1] Reclassifications between various asset categories due to completion of plant and other equipment under construction

[2] Derecognition of assets that are no longer used and are not considered to have a significant disposal value or other alternative use

10. Goodwill and intangible assets

The following table summarizes the movements of goodwill and intangible assets in 2018:

	Goodwill	Intangible assets other than goodwill						
(USD millions)	Total	In-process research and development	Alcon brand name	Technologies	Currently marketed products	Marketing know-how	Other intangible assets	Total
Cost								
January 1, 2018	32 179	6 462	2 980	6 638	34 105	5 960	1 852	57 997
Cost of assets related to disposal group held for sale [1]		– 9		– 276	– 1 116		– 2	– 1 403
Impact of business combinations	4 084	10 224			2 531		1	12 756
Reclassifications [2]		– 697			479		218	
Additions [3]		477		2	728		385	1 592
Disposals and derecognitions [4]		– 214		– 70	– 928		– 183	– 1 395
Impairment charge [5]	– 183							
Currency translation effects	– 380	– 76		– 41	– 387		– 18	– 522
December 31, 2018	35 700	16 167	2 980	6 253	35 412	5 960	2 253	69 025
Accumulated amortization								
January 1, 2018	– 429	– 1 170		– 4 268	– 19 631	– 1 668	– 1 263	– 28 000
Accumulated amortization / impairments on assets related to disposal group held for sale [1]		2		107	816			925
Amortization charge [5]				– 570	– 2 521	– 238	– 310	– 3 639
Accumulated impairments on disposals and derecognitions [4]		209			791		257	1 257
Impairment charge [5]		– 167		– 53	– 825		– 4	– 1 049
Currency translation effects	23	6		26	152		16	200
December 31, 2018	– 406	– 1 120		– 4 758	– 21 218	– 1 906	– 1 304	– 30 306
Net book value at December 31, 2018	35 294	15 047	2 980	1 495	14 194	4 054	949	38 719

[1] Note 2 provides additional disclosures related to assets of disposal group held for sale.

[2] Reclassifications between various asset categories as a result of product launches of acquired In-Process Research & Development and completion of software development

[3] No addition in the disposal group held for sale for the period from January 1, 2018, to the date of reclassification to assets held for sale.

[4] Derecognitions of assets that are no longer used or being developed and are not considered to have a significant disposal value or other alternative use

[5] Amortization related to the disposal group held for sale for the period from January 1, 2018, to the date of reclassification to assets held for sale was USD 45 million

Impairment charges related to the disposal group held for sale for the write-down of the allocated goodwill were USD 183 million and for the currently marketed products were

USD 37 million (thereof USD 9 million recognized for the period from January 1, 2018, to the date of reclassification to assets held for sale)

The following table summarizes the movements of goodwill and intangible assets in 2017:

	Goodwill	Intangible assets other than goodwill						
(USD millions)	Total	In-process research and development	Alcon brand name	Technologies	Currently marketed products	Marketing know-how	Other intangible assets	Total
Cost								
January 1, 2017	31 381	5 150	2 980	6 548	33 007	5 960	1 492	55 137
Impact of business combinations	94	1 223						1 223
Reclassifications [1]		– 389			175		214	
Additions		697		5	282		162	1 146
Disposals and derecognitions [2]		– 353		– 1	– 328		– 64	– 746
Currency translation effects	704	134		86	969		48	1 237
December 31, 2017	32 179	6 462	2 980	6 638	34 105	5 960	1 852	57 997
Accumulated amortization								
January 1, 2017	– 401	– 886		– 3 637	– 16 863	– 1 430	– 981	– 23 797
Reclassifications [1]		6			– 6			
Amortization charge				– 577	– 2 571	– 238	– 304	– 3 690
Accumulated impairments on disposals and derecognitions[2]		352			317		61	730
Impairment charge		– 615			– 92		– 2	– 709
Currency translation effects	– 28	– 27		– 54	– 416		– 37	– 534
December 31, 2017	– 429	– 1 170		– 4 268	– 19 631	– 1 668	– 1 263	– 28 000
Net book value at December 31, 2017	31 750	5 292	2 980	2 370	14 474	4 292	589	29 997

[1] Reclassifications between various asset categories as a result of product launches of acquired In-Process Research & Development and completion of software development

[2] Derecognitions of assets that are no longer used or being developed and are not considered to have a significant disposal value or other alternative use

The following table summarizes the allocation of the net book values of goodwill and intangible assets by reporting segment at December 31, 2018:

	Goodwill	Intangible assets other than goodwill						
(USD millions)	Total	In-process research and development	Alcon brand name	Technologies	Currently marketed products	Marketing know-how	Other intangible assets	Total
Innovative Medicines	18 551	14 377		6	11 228		431	26 042
Sandoz (excluding assets of disposal group held for sale)	7 837	419		304	1 115		37	1 875
Alcon	8 899	246	2 980	1 185	1 851	4 054	363	10 679

Corporate	7	5					118	123
Net book value at December 31, 2018	35 294	15 047	2 980	1 495	14 194	4 054	949	38 719

The following table summarizes the allocation of the net book values of goodwill and intangible assets by reporting segment at December 31, 2017: [1]

	Goodwill	Intangible assets other than goodwill					
(USD millions)	Total	In-process research and development	Alcon brand name	Technologies	Currently marketed products	Marketing know-how	Other intangible assets	Total
Innovative Medicines	14 637	4 368		9	10 786		354	15 517
Sandoz	8 210	625		539	1 589		30	2 783
Alcon	8 895	291	2 980	1 822	2 099	4 292	194	11 678
Corporate	8	8					11	19
Net book value at December 31, 2017	31 750	5 292	2 980	2 370	14 474	4 292	589	29 997

[1] Restated to reflect the product transfers between the Innovative Medicines and the Alcon Division that was effective January 1, 2018, and the Alcon brand name reclassification from Corporate to the Alcon Division. These restatements had no impact on Sandoz or the total Group. See Note 3.

The Innovative Medicines, Sandoz and Alcon Divisions' cash generating units, to which goodwill is allocated, each comprise a group of smaller cash-generating units. The valuation method of the recoverable amount of the cash generating units, to which goodwill is allocated, is based on the fair value less costs of disposal.

In the prior year, the Alcon brand name indefinite life intangible asset was reported in Corporate, as it was used to market products of the Alcon Division and products within the Ophthalmology business franchise of the Innovative Medicines Division. In connection with the planned spin-off of the Alcon Division (see Note 30), it is the intention of the Novartis Group to transfer the full rights of the Alcon brand name to the Alcon Division. As a result, the Innovative Medicines Division started the process to rebrand the products within its Ophthalmology business franchise and will no longer use the Alcon brand name. As a result, the Alcon brand name indefinite life intangible asset is reported in the Alcon Division in all years presented. In 2018, net sales of the Alcon Division products together are the grouping of cash-generating units, which are used to determine the recoverable amount. In the prior year, net sales of products within Innovative Medicines, Ophthalmology business franchise and Alcon Division products, which used the Alcon brand name, together were the grouping of cash-generating units, which were used to determine the recoverable amounts. The valuation method is based on the fair value less costs of disposal.

The following assumptions are used in the calculations:

(As a percentage)	Innovative Medicines	Sandoz	Alcon
Terminal growth rate	1.5	2.0	3.0
Discount rate (post-tax)	7.5	7.5	7.5

The Alcon terminal growth rate assumption of 3% is higher than the expected inflation rate of the medical device industry, and more specifically the ophthalmic sub-segment of the industry. The growth rates are expected to exceed this long-term inflation rate, as the aging population to which Alcon's products are prescribed is growing faster than the general population.

The discount rates for all divisions consider the Group's weighted average cost of capital, adjusted to approximate the weighted average cost of capital of a comparable market participant.

The fair value less costs of disposal, for all groupings of cash-generating units containing goodwill or indefinite life intangible assets, is reviewed for the impact of reasonably possible changes in key assumptions. In particular, we considered an increase in the discount rate, a decrease in the terminal growth rate, and certain negative impacts on the forecasted cash flows. These reasonably possible changes in key assumptions did not indicate an impairment.

"Note 1. Significant accounting policies—Impairment of goodwill and intangible assets" provides additional disclosures on how the Group performs goodwill and intangible asset impairment testing.

The following table shows the intangible asset and goodwill impairment charges for 2018 and 2017:

(USD millions)	2018	2017
Innovative Medicines [1]	– 592	– 591
Sandoz [2]	– 249	– 61
Alcon [3]	– 391	– 57
Total	– 1 232	– 709

[1] 2018 includes an impairment of USD 400 million related to a partial write-down of the *Votrient* currently marketed product; 2017 includes an impairment of USD 465 million related to the write-down of the Serelaxin IPR&D

[2] 2018 includes impairments of USD 220 million related to the write-down of the allocated goodwill (USD 183 million) and the currently marketed products (USD 37 million) related to the pending divestment of the Sandoz US dermatology business and generic US oral solids portfolio. (see Note 2)

[3] 2018 includes an impairment of USD 337 million related to the write-down of the *CyPass* currently marketed product, which was acquired with the Alcon Division 2016 acquisition of Transcend Medical, Inc. (see Note 2)

11. Deferred tax assets and liabilities

(USD millions)	Property, plant & equipment	Intangible assets	Pensions and other benefit obligations of associates	Inventories	Tax loss carry-forwards	Other assets, provisions and accruals	Total
Gross deferred tax assets at January 1, 2018	137	1 287	1 090	3 786	97	1 983	8 380
Gross deferred tax liabilities at January 1, 2018	– 613	– 2 985	– 254	– 455	– 9	– 1 003	– 5 319
Net deferred tax balance at January 1, 2018	– 476	– 1 698	836	3 331	88	980	3 061
At January 1, 2018	– 476	– 1 698	836	3 331	88	980	3 061
Net deferred tax balance related to disposal group held for sale	1	1		– 6	– 1	– 1	– 6
Credited/(charged) to income	31	378	4	– 86	– 113	368	582
Charged to equity						– 17	– 17
Charged to other comprehensive income			69			8	77
Impact of business combinations		– 2 874			298	83	– 2 493
Other movements	13	42	6	9	1	– 51	20
Net deferred tax balance at December 31, 2018	– 431	– 4 151	915	3 248	273	1 370	1 224
Gross deferred tax assets at December 31, 2018 without disposal group	191	1 233	1 188	3 722	273	2 175	8 782
Gross deferred tax liabilities at December 31, 2018 without disposal group	– 622	– 5 384	– 273	– 474		– 805	– 7 558
Net deferred tax balance at December 31, 2018 without disposal group	– 431	– 4 151	915	3 248	273	1 370	1 224
After offsetting the following amount of deferred tax assets and liabilities within the same tax jurisdiction the balance amounts to:							83
Deferred tax assets at December 31, 2018							8 699
Deferred tax liabilities at December 31, 2018							– 7 475
Net deferred tax balance at December 31, 2018							1 224
	224	1 331	1 839	4 160	146	2 597	10 297

Gross deferred tax assets at January 1, 2017							
Gross deferred tax liabilities at January 1, 2017	– 629	– 4 019	– 358	– 511		– 1 403	– 6 920
Net deferred tax balance at January 1, 2017	– 405	– 2 688	1 481	3 649	146	1 194	3 377
At January 1, 2017	– 405	– 2 688	1 481	3 649	146	1 194	3 377
Credited/(charged) to income	– 30	1 279	– 90	– 304	– 49	– 46	760
Charged to equity						– 101	– 101
Charged to other comprehensive income			– 592			– 69	– 661
Impact of business combinations		– 322			5		– 317
Other movements	– 41	33	37	– 14	– 14	2	3
Net deferred tax balance at December 31, 2017	– 476	– 1 698	836	3 331	88	980	3 061
Gross deferred tax assets at December 31, 2017	137	1 287	1 090	3 786	97	1 983	8 380
Gross deferred tax liabilities at December 31, 2017	– 613	– 2 985	– 254	– 455	– 9	– 1 003	– 5 319
Net deferred tax balance at December 31, 2017	– 476	– 1 698	836	3 331	88	980	3 061

After offsetting the following amount of deferred tax assets and liabilities within the same tax jurisdiction the balance amounts to:	151
Deferred tax assets at December 31, 2017	8 229
Deferred tax liabilities at December 31, 2017	– 5 168
Net deferred tax balance at December 31, 2017	3 061

The following table presents deferred tax assets and deferred tax liabilities, which are expected to have an impact on current taxes payable after more than 12 months:

(USD billions)	2018	2017
Expected to have an impact on current tax payable after more than 12 months		
– Deferred tax assets	3.9	3.5
– Deferred tax liabilities	6.7	4.4

For unremitted earnings retained by consolidated entities for reinvestment, no provision is made for income taxes that would be payable upon the distribution of these earnings. If these earnings were remitted, an income tax charge could result based on the tax statutes currently in effect.

(USD billions)	2018	2017
Unremitted earnings that have been retained by consolidated entities for reinvestment	73	66

Temporary differences on which no deferred tax has been provided as they are permanent in nature related to:

(USD billions)	2018	2017
Investments in subsidiaries	3	3
Goodwill from acquisitions	– 33	– 29

The gross value of tax-loss carry-forwards that have, or have not, been capitalized as deferred tax assets, with their expiry dates is as follows:

(USD millions)	Not capitalized	Capitalized	2018 total
One year	23	4	27
Two years	14	0	14
Three years	27	12	39
Four years	65	5	70
Five years	345	36	381
More than five years	522	2 288	2 810
Total	996	2 345	3 341

(USD millions)	Not capitalized	Capitalized	2017 total
One year	37	3	40
Two years	64	4	68
Three years	87	5	92
Four years	26	25	51
Five years	67	16	83
More than five years	654	1 671	2 325
Total	935	1 724	2 659

(USD millions)	2018	2017	2016
Tax losses carried forward that expired	8	1	19

Deferred tax assets related to taxable losses of relevant Group entities are recognized to the extent it is considered probable that future taxable profits will be available against which such losses can be utilized in the foreseeable future.

On December 22, 2017, the US enacted tax reform legislation (Tax Cuts and Jobs Act), which – among other provisions – reduced the US corporate tax rate from 35% to 21%, effective January 1, 2018. This required a revaluation of the deferred tax assets and liabilities and a portion of current tax payables to the newly enacted tax rates at the date of enactment.

The following table shows the impact on the revaluation of deferred assets and liabilities and current income tax liabilities at December 31, 2017:

(USD millions)	Income statement	Equity	Total
Deferred tax asset and liability revaluation			
Items previously recognized in consolidated income statement	– 24		– 24
Items previously recognized in other comprehensive income [1]		– 254	– 254
Items previously recognized in retained earnings [2]		– 71	– 71
Total revaluation of deferred tax assets and liabilities	– 24	– 325	– 349
Total revaluation of current tax payables	– 37		– 37
Total revaluation of deferred tax assets and liabilities and current income tax liabilities	– 61	– 325	– 386

[1] Related to post-employment benefits and available for sale financial investments

[2] Related to equity based compensation plans

The enacted US tax reform legislation includes a provision that requires the US parent company's foreign subsidiaries' unremitted earnings to be subject to an immediate toll tax on the qualifying amount of unremitted earnings (the deemed repatriated earnings). Previously, these earnings were taxable upon distribution to the US parent company. The toll tax amount owed is payable, without interest, in installments over an eight-year period through 2024. Certain of the Group's US subsidiaries are the parent company of non-US domiciled companies, and as a result, USD 70 million of deferred tax liabilities related to these entities' unremitted earnings, the majority of which were recognized in 2016, were reclassified to current income tax liabilities at December 31, 2017.

12. Financial and other non-current assets

Financial assets

(USD millions)	2018	2017
Equity securities	1 155	1 073
Debt securities	31	36
Fund investments	251	166
Total financial investments	1 437	1 275
Long-term receivables from customers	164	197
Minimum lease payments from finance lease agreements	91	122
Contingent consideration receivables [1]	396	394
Long-term loans, advances and security deposits	257	255
Total financial assets	2 345	2 243

[1] Note 28 provides additional disclosures related to contingent considerations.

Other non-current assets

(USD millions)	2018	2017
Deferred compensation plans	468	484
Prepaid post-employment benefit plans	137	133
Other non-current assets	290	201
Total other non-current assets	895	818

Minimum finance lease payments

The following table shows the receivables of the gross investments in finance leases and the net present value of the minimum lease payments, as well as unearned finance income, related to surgical equipment lease arrangements. The finance income is recorded in “Other income.”

	2018					2017				
(USD millions)	Total future payments	Unearned finance income	Present value	Provision	Net book value	Total future payments	Unearned finance income	Present value	Provision	Net book value
Not later than one year [1]	64	– 5	59	– 2	57	83	– 7	76	– 3	73
Between one and five years	117	– 9	108	– 28	80	180	– 14	166	– 59	107
Later than five years	48	– 2	46	– 35	11	31	– 2	29	– 14	15
Total	229	– 16	213	– 65	148	294	– 23	271	– 76	195

[1] The current portion of the minimum lease payments is recorded in trade receivables or other current assets (to the extent not yet invoiced).

13. Inventories

(USD millions)	2018	2017
Raw material, consumables	931	841
Work in progress	3 087	2 957
Finished products	2 938	3 069
Total inventories	6 956	6 867

The following table shows the amount of inventory recognized as an expense in “Cost of goods sold” in the consolidated income statements:

(USD billions)	2018	2017	2016
Cost of goods sold	– 10.4	– 10.3	– 10.3

The following table shows the recognized amount of inventory provision and reversals of inventory provision:

(USD millions)	2018	2017	2016

Inventory provisions	– 751	– 470	– 283
Reversals of inventory provisions	272	189	67

The reversals mainly result from the release of products initially requiring additional quality control inspections and from the reassessment of inventory values manufactured prior to regulatory approval but for which approval was subsequently received.

14. Trade receivables

(USD millions)	2018	2017
Total gross trade receivables	8 853	8 790
Provisions for doubtful trade receivables	– 126	– 190
Total trade receivables, net	8 727	8 600

The following table summarizes the movement in the provision for expected credit losses:

(USD millions)	2018	2017	2016
January 1	– 190	– 162	– 142
Impact of divestments		12	
Impact of business combination	– 1		
Provisions for doubtful trade receivables charged to the consolidated income statement	– 47	– 119	– 76
Utilization provisions for doubtful trade receivables	39	12	17
Reversal of provisions for doubtful trade receivables	61	76	37
Currency translation effects	12	– 9	2
December 31	– 126	– 190	– 162

The following sets forth the trade receivables that are not overdue as specified in the payment terms and conditions established with Novartis customers, as well as an analysis of overdue amounts and related provisions for doubtful trade receivable:

(USD millions)	2018	2017
Not overdue	7 916	7 758
Past due for not more than one month	296	279
Past due for more than one month but less than three months	194	230
Past due for more than three months but less than six months	136	137
Past due for more than six months but less than one year	98	137
Past due for more than one year	213	249
Provisions for doubtful trade receivables	– 126	– 190
Total trade receivables, net	8 727	8 600

Trade receivable balances include sales to drug wholesalers, retailers, private health systems, government agencies, managed care providers, pharmacy benefit managers and government-supported healthcare systems. Novartis continues to monitor sovereign debt issues and economic conditions, particularly in Greece, Italy, Portugal, Spain, Brazil, Russia, Saudi Arabia, Turkey, and Argentina, which has been included in 2018, and evaluates trade receivables in these countries for potential collection risks. The majority of the outstanding trade receivables from Greece, Portugal, Saudi Arabia and Spain are due directly from local governments or from government-funded entities. Deteriorating credit and economic conditions as well as other factors in these closely monitored countries have resulted in, and may continue to result in, an increase in the average length of time that it takes to collect these trade receivables and may require the Group to re-evaluate the estimated collectible amount of these trade receivables in future periods.

The following table shows the gross trade receivables balance from these closely monitored countries at December 31, 2018 and 2017, the amounts that are past due for more than one year, and the related provisions that have been recorded:

(USD millions)	2018	2017
Total balance of gross trade receivables from closely monitored countries	1 729	1 733
Past due for more than one year	97	124
Provisions	44	95

At December 31, 2018, amounts past due for more than one year are not significant in any of these countries on a standalone basis.

Total trade receivables include amounts denominated in the following major currencies:

(USD millions)	2018	2017

US dollar (USD)	3 510	3 451
Euro (EUR)	1 551	1 533
Japanese yen (JPY)	658	600
Chinese yuan (CNY)	282	312
Russian ruble (RUB)	247	268
Brazilian real (BRL)	206	237
British pound (GBP)	183	208
Australian dollar (AUD)	161	165
Swiss franc (CHF)	100	127
Canadian dollar (CAD)	136	73
Other currencies	1 693	1 626
Total trade receivables, net	8 727	8 600

15. Marketable securities, commodities, time deposits, derivative financial instruments, and cash and cash equivalents

Marketable securities, commodities, time deposits and derivative financial instruments

(USD millions)	2018	2017
Debt securities	325	328
Fund investments	35	34
Total marketable securities	360	362
Commodities	104	106
Time deposits and short-term investments with original maturity more than 90 days	2 087	125
Derivative financial instruments	130	31
Accrued interest on debt securities, time deposits and short-term investments	12	1
Total marketable securities, commodities, time deposits and derivative financial instruments	2 693	625

The following table provides a breakdown of debt securities by currency:

(USD millions)	2018	2017
US dollar (USD)	302	303
Euro (EUR)	12	14
Japanese yen (JPY)	11	11
Total debt securities	325	328

Cash and cash equivalents

(USD millions)	2018	2017
Current accounts	3 121	2 970
Time deposits and short-term investments with original maturity less than 90 days	10 150	5 890
Total cash and cash equivalents	13 271	8 860

16. Other current assets

(USD millions)	2018	2017
VAT receivable	588	717
Withholding tax recoverable	99	93
Prepaid expenses		
– Third parties	811	753
– Associated companies	1	3
Receivables from associated companies	2	8
Contingent consideration receivable [1]		450
Other receivables and current assets	1 360	1 030
Total other current assets	2 861	3 054

[1] Note 28 provides additional disclosures related to contingent consideration.

17. Equity

The following table shows the movement in the share capital:

(USD millions)	Jan 1, 2016	Movement in year	Dec 31, 2016	Movement in year	Dec 31, 2017	Movement in year	Dec 31, 2018
Share capital	991	– 19	972	– 3	969	– 25	944
Treasury shares	– 101	25	– 76	– 24	– 100	31	– 69
Outstanding share capital	890	6	896	– 27	869	6	875

The following table shows the movement in the shares:

		2018			2017			2016	
Number of outstanding shares (in millions)	Note	Total Novartis shares	Total treasury shares [1]	Total outstanding shares	Total Novartis shares	Total treasury shares [1]	Total outstanding shares	Total Novartis shares	Total treasury shares [1]	Total outstanding shares
Balance at beginning of year		2 616.8	– 299.3	2 317.5	2 627.1	– 253.0	2 374.1	2 677.0	– 303.1	2 373.9
Shares canceled for capital reduction [2]		– 66.2	66.2		– 10.3	10.3		– 49.9	49.9	
Shares acquired to be canceled [3]			– 23.3	– 23.3		– 66.2	– 66.2		– 10.3	– 10.3
Other share purchases [4]			– 1.2	– 1.2		– 3.8	– 3.8		– 2.6	– 2.6
Other share sales			3.0	3.0						
Exercise of options and employee transactions [5]	17.8		7.8	7.8		4.6	4.6		4.1	4.1
Equity-based compensation [5]			7.4	7.4		8.8	8.8		9.0	9.0
Total movements		– 66.2	59.9	– 6.3	– 10.3	– 46.3	– 56.6	– 49.9	50.1	0.2
Balance at end of year		2 550.6	– 239.4	2 311.2	2 616.8	– 299.3	2 317.5	2 627.1	– 253.0	2 374.1

[1] Approximately 121.6 million treasury shares (2017: 131.3 million; 2016: 134.6 million) are held in Novartis entities that restrict their availability for use.

[2] Novartis reduced its share capital by canceling shares that were repurchased on the SIX Swiss Exchange second trading line during previous years.

[3] Shares repurchased on the SIX Swiss Exchange second trading line under the CHF 10 billion share buyback authority approved at the 2016 Annual General Meeting (AGM)

[4] Shares acquired from employees, which were previously granted to them under the respective programs

[5] Shares delivered as a result of options being exercised and physical share deliveries related to equity-based participation plans

17.1) The amount available for distribution as a dividend to shareholders is based on the available distributable retained earnings of Novartis AG determined in accordance with the legal provisions of the Swiss Code of

Obligations.

	2018	2017	2016
Dividend per share (in CHF)	2.80	2.75	2.70
Total dividend payment (in USD billion)	7.0	6.5	6.5

17.2) The following table summarizes the treasury shares movements:

		2018		2017		2016	
	Note	Number of outstanding shares (in millions)	Equity impact USD m	Number of outstanding shares (in millions)	Equity impact USD m	Number of outstanding shares (in millions)	Equity impact USD m
Shares acquired to be canceled [1]		– 23.3	– 1 859	– 66.2	– 5 270	– 10.3	– 784
Other share purchases [2]		– 1.2	– 114	– 3.8	– 304	– 2.6	– 208
Purchase of treasury shares		– 24.5	– 1 973	– 70.0	– 5 574	– 12.9	– 992
Other share sales		3.0	263				
Exercise of options and employee transactions [3]	17.8	7.8	434	4.6	255	4.1	214
Equity-based compensation [4,5]		7.4	756	8.8	612	9.0	664
Total		– 6.3	– 520	– 56.6	– 4 707	0.2	– 114

[1] Shares repurchased on the SIX Swiss Exchange second trading line under the CHF 10 billion share buyback authority approved at the 2016 Annual General Meeting (AGM)

[2] Shares acquired from employees, which were previously granted to them under the respective programs

[3] Shares delivered as a result of options being exercised related to equity-based participation plans and the delivery of treasury shares. The average share price of the shares delivered was significantly below market price, reflecting the strike price of the options exercised.

[4] Equity-settled share-based compensation is expensed in the consolidated income statement in accordance with the vesting period of the share-based compensation plans. The value for the shares and options granted is credited to consolidated equity over the respective vesting period. In addition, tax benefits arising from tax-deductible amounts exceeding the expense recognized in the income statement are credited to equity.

[5] Included in 2017 is a USD 71 million impact related to the revaluation of deferred tax assets on equity-based compensation that were previously recognized through retained earnings. This revaluation resulted from the US tax reform legislation enacted on December 22, 2017; refer to Note 11 for additional disclosures.

17.3) In 2018, Novartis entered into an irrevocable, non-discretionary arrangement with a bank to repurchase Novartis shares on the second trading line under its up-to USD 5 billion share buyback. Novartis can cancel this arrangement at any time but may be subject to a 90-day waiting period. The commitment under this arrangement therefore reflects the obligated purchases by the bank under such trading plan over a rolling 90-day period, or if shorter, until the maturity date of such trading plan. The commitment under this arrangement amounted to USD 284 million as of December 31, 2018.

In 2017, Novartis entered into a similar irrevocable, non-discretionary arrangement with a bank to repurchase Novartis shares. The commitment under this arrangement reflected the expected purchases by the bank under such trading plan over a rolling 90-day period. As of December 31, 2017, this trading plan commitment was fully executed and expired, and as a consequence, there is no contingent liability related to this plan recognized.

17.4) Transaction costs of USD 79 million, net of tax, that are directly attributable to the potential distribution (spin-off) of Alcon to Novartis shareholders and that would otherwise have been avoided, are recorded as a deduction from equity. See Note 1.

17.5) The impact of change in ownership of consolidated entities represents the excess of the amount paid to non-controlling interest over their carrying value and equity allocation to non-controlling interest due to change in ownership percentage.

17.6) Changes in non-controlling interests represent the impact on the non-controlling interest of transactions with minority shareholders such as change in ownership percentage, dividend payments and other equity transactions.

17.7) Other movements includes, for subsidiaries in hyperinflationary economies, the impact of the restatement of the non-monetary assets and liabilities with the general price index at the beginning of the period as well as the restatement of the equity balances of the current year. In 2018, the amount recorded in equity related to hyperinflation

accounting was USD 38 million (2017: USD nil, 2016: USD nil). See Note 1.

17.8) At December 31, 2018, the market maker held 11 million written call options, originally issued as part of the share-based compensation for associates that have not yet been exercised. The weighted average exercise price of these options is USD 62.70 and they have contractual lives of 10 years, with remaining lives up to five years. In December 2018, Novartis entered into an agreement with the market maker for its employee options to repurchase a portion of the outstanding written call options that are not exercised in exchange for treasury shares.

18. Non-current financial debt

(USD millions)	2018	2017
Straight bonds	25 283	22 957
Liabilities to banks and other financial institutions [1]	285	539
Finance lease obligations	92	87
Total, including current portion of non-current financial debt	25 660	23 583
Less current portion of non-current financial debt	– 3 190	– 359
Total non-current financial debts	22 470	23 224

[1] Average interest rate 0.3% (2017: 0.3%)

All bonds are initially recorded at the amount of proceeds received, net of transaction costs. They are subsequently carried at amortized cost, with the difference between the proceeds, net of transaction costs, and the amount due on redemption being recognized as a charge to the consolidated income statement over the period of the relevant bond.

Financial debts, including current financial debts, contain only general default covenants. The Group is in compliance with these covenants.

The percentage of fixed-rate financial debt to total financial debt was 80% at December 31, 2018, and 82% at December 31, 2017.

The average interest rate on total financial debt in 2018 was 2.7% (2017: 2.6%).

The following table provides a breakdown of straight bonds:

Coupon	Currency	Nominal amount	Issuance year	Maturity year	Issuer	Issue price	2018 (USD millions)	2017 (USD millions)
5.125%	USD	3 000	2009	2019	Novartis Securities Investment Ltd., Hamilton, Bermuda	99.822%	3 000	2 997
4.400%	USD	1 000	2010	2020	Novartis Capital Corporation, New York, United States	99.237%	998	997
2.400%	USD	1 500	2012	2022	Novartis Capital Corporation, New York, United States	99.225%	1 493	1 491
3.700%	USD	500	2012	2042	Novartis Capital Corporation, New York, United States	98.325%	489	489
3.400%	USD	2 150	2014	2024	Novartis Capital Corporation, New York, United States	99.287%	2 137	2 134
4.400%	USD	1 850	2014	2044	Novartis Capital Corporation, New York, United States	99.196%	1 825	1 824
0.750%	EUR	600	2014	2021	Novartis Finance S.A., Luxembourg, Luxembourg	99.134%	683	713
1.625%	EUR	600	2014	2026	Novartis Finance S.A., Luxembourg, Luxembourg	99.697%	684	714
0.250%	CHF	500	2015	2025	Novartis AG, Basel, Switzerland	100.640%	508	513
0.625%	CHF	550	2015	2029	Novartis AG, Basel, Switzerland	100.502%	558	564
1.050%	CHF	325	2015	2035		100.479%	330	333

3.000%	USD	1 750	2015	2025	Novartis AG, Basel, Switzerland Novartis Capital Corporation, New York, United States	99.010%	1 732	1 730
4.000%	USD	1 250	2015	2045	Novartis Capital Corporation, New York, United States	98.029%	1 219	1 218
0.125%	EUR	1 250	2016	2023	Novartis Finance S.A., Luxembourg, Luxembourg	99.127%	1 419	1 480
0.625%	EUR	500	2016	2028	Novartis Finance S.A., Luxembourg, Luxembourg	98.480%	563	588
1.800%	USD	1 000	2017	2020	Novartis Capital Corporation, New York, United States	99.609%	998	996
2.400%	USD	1 000	2017	2022	Novartis Capital Corporation, New York, United States	99.449%	995	993
3.100%	USD	1 000	2017	2027	Novartis Capital Corporation, New York, United States	99.109%	989	988
0.000%	EUR	1 250	2017	2021	Novartis Finance S.A., Luxembourg, Luxembourg	99.133%	1 421	1 480
1.125%	EUR	600	2017	2027	Novartis Finance S.A., Luxembourg, Luxembourg	99.874%	684	715
0.500%	EUR	750	2018	2023	Novartis Finance S.A., Luxembourg, Luxembourg	99.655%	853	
1.375%	EUR	750	2018	2030	Novartis Finance S.A., Luxembourg, Luxembourg	99.957%	856	
1.700%	EUR	750	2018	2038	Novartis Finance S.A., Luxembourg, Luxembourg	99.217%	849	
Total straight bonds							25 283	22 957

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The following tables provide a breakdown of total non-current financial debt, including current portion by maturity and currency:

Breakdown by maturity:

(USD millions)	2018	2017
2018		359
2019	3 190	3 173
2020	2 006	1 997
2021	2 111	2 194
2022	2 585	2 485
2023	2 278	1 480
After 2023	13 490	11 895
Total	25 660	23 583

Breakdown by currency:

(USD millions)	2018	2017
US dollar (USD)	15 964	15 945
Euro (EUR)	8 028	5 695
Japanese yen (JPY)	272	533
Swiss franc (CHF)	1 396	1 410
Total	25 660	23 583

The following table shows the comparison of balance sheet and fair value of total non-current financial debt, including current portion:

(USD millions)	2018 Balance sheet	2018 Fair values	2017 Balance sheet	2017 Fair values
Straight bonds	25 283	25 438	22 957	23 835
Others	377	377	626	626
Total	25 660	25 815	23 583	24 461

The fair values of straight bonds are determined by quoted market prices. Other financial debts are recorded at notional amounts, which are a reasonable approximation of the fair values.

The following table shows the pledged assets:

(USD millions)	2018	2017
Total net book value of property, plant & equipment pledged as collateral for non-current financial debts	96	84

19. Provisions and other non-current liabilities

(USD millions)	2018	2017
Accrued liability for employee benefits:		
Defined benefit pension plans [1]	3 546	3 157
Other long-term employee benefits and deferred compensation	600	625
Other post-employment benefits [1]	954	953
Environmental remediation provisions	634	706
Provisions for product liabilities, governmental investigations and other legal matters	214	230
Contingent consideration [2]	874	809
Other non-current liabilities	497	577
Total provisions and other non-current liabilities	7 319	7 057

[1] Note 24 provides additional disclosures related to post-employment benefits.

[2] Note 28 provides additional disclosures related to contingent consideration.

Novartis believes that its total provisions are adequate based upon currently available information. However, given the inherent difficulties in estimating liabilities in this area, Novartis may incur additional costs beyond the amounts provided. Management believes that such additional amounts, if any, would not be material to the Group’s financial

condition but could be material to the results of operations or cash flows in a given period.

Environmental remediation provisions

The following table shows the movements in the environmental liability provisions:

(USD millions)	2018	2017	2016
January 1	761	773	871
Cash payments	– 48	– 46	– 75
Releases	– 21	– 153	
Additions	7	154	1
Currency translation effects	– 7	33	– 24
December 31	692	761	773
Less current provision	– 58	– 55	– 65
Non-current environmental remediation provisions at December 31	634	706	708

The material components of the environmental remediation provisions consist of costs to sufficiently clean and refurbish contaminated sites to the extent necessary and to continue surveillance at sites where the environmental remediation exposure is less significant.

A substantial portion of the environmental remediation provisions relate to the remediation of Basel regional landfills in the adjacent border areas in Switzerland, Germany and France. The provisions are re-assessed on a yearly basis and adjusted as necessary.

In the United States, Novartis has been named under federal legislation (the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended) as a potentially responsible party (PRP) in respect of certain sites. Novartis actively participates in, or monitors, the cleanup activities at the sites in which it is a PRP. The provision takes into consideration the number of other PRPs at each site as well as the identity and financial position of such parties in light of the joint and several nature of the liability.

The expected timing of the related cash outflows as of December 31, 2018, is currently projected as follows:

(USD millions)	Expected cash outflows
Due within two years	150
Due later than two years, but within five years	185
Due later than five years, but within ten years	297
Due after ten years	60
Total environmental remediation liability provisions	692

Provisions for product liabilities, governmental investigations and other legal matters

Novartis has established provisions for certain product liabilities, governmental investigations and other legal matters where a potential cash outflow is probable and Novartis can make a reliable estimate of the amount of the outflow. These provisions represent the Group's current best estimate of the total financial effect for the matters described below and for other less significant matters. Potential cash outflows reflected in a provision might be fully or partially off-set by insurance in certain circumstances.

Novartis has not established provisions for potential damage awards for certain additional legal claims against its subsidiaries if Novartis currently believes that a payment is either not probable or cannot be reliably estimated. In total, these not-provisioned-for matters include more than 2 000 individual product liability cases and certain other legal matters. Plaintiffs' alleged claims in these matters, which Novartis does not believe to be entirely remote but which do not fulfill the conditions for the establishment of provisions, currently aggregate to, according to Novartis' current best belief, approximately USD 1.5 billion. In addition, in some of these matters there are claims for punitive or multiple (treble) damages, civil penalties and disgorgement of profits that in Novartis' view are either wholly or partially unspecified or wholly or partially unquantifiable at present; the Group believes that information about these amounts claimed by plaintiffs generally is not meaningful for purposes of determining a reliable estimate of a loss that is probable or more than remote.

A number of other legal matters are in such early stages or the issues presented are such that the Group has not made any provisions since it cannot currently estimate either a potential outcome or the amount of any potential losses. For these reasons, among others, the Group generally is unable to make a reliable estimate of possible loss with respect to such cases. It is therefore not practicable to provide information about the potential financial impact of those cases.

There might also be cases for which the Group was able to make a reliable estimate of the possible loss or the range of possible loss, but the Group believes that publication of such information on a case-by-case basis would seriously prejudice the Group's position in ongoing legal proceedings or in any related settlement discussions. Accordingly, in such cases, information has been disclosed with respect to the nature of the contingency, but no disclosure is provided as to an estimate of the possible loss or range of possible loss.

Note 27 contains additional information on contingencies.

Summary of significant legal proceedings

The following is a summary of significant legal proceedings to which Novartis or its subsidiaries are a party or were a party and that concluded in 2018.

Alcon pending spin-off (see Note 30): In case of approval of the Alcon spin-off, under the Separation and Distribution Agreement Novartis will enter into with Alcon in connection with the separation and the spin-off, Novartis and Alcon will each agree, subject to certain conditions and except to the extent otherwise described below with respect to any matter, to indemnify the other party and its directors, officers, employees and other representatives against any pending or future liabilities or claims that constitute either a Novartis Group liability, in the case of Novartis, or an Alcon liability, in the case of Alcon, under the terms of the Separation and Distribution Agreement, based on whether such claim or lia-

bility relates to the Novartis or the Alcon business and products.

Investigations and related litigations

Southern District of New York (S.D.N.Y.) marketing practices investigation and litigation

In 2013, the US government filed a civil complaint in intervention to an individual *qui tam* action against Novartis Pharmaceuticals Corporation (NPC) in the United States District Court (USDC) for the S.D.N.Y. The complaint, as subsequently amended, asserts federal False Claims Act (FCA) and common law claims with respect to speaker programs and other promotional activities for certain NPC cardiovascular medications (*Lotrel*, *Starlix* and *Valturna*) allegedly serving as mechanisms to provide kickbacks to healthcare professionals (HCPs). It seeks damages, which according to the complaint are "substantial", including treble damages and maximum civil penalties per claim, as well as disgorgement of Novartis profits from the alleged unlawful conduct. Also in 2013, New York State filed a civil complaint in intervention asserting similar claims. Neither government complaint in intervention adopted the individual relator's claims with respect to off-label promotion of *Valturna*, which were subsequently dismissed with prejudice by the court. The individual relator continues to litigate the kickback claims on behalf of other states and municipalities. A trial in the S.D.N.Y. matter is currently scheduled in 2019. The claims are being vigorously contested.

S.D.N.Y./Western District of New York healthcare fraud investigation

In 2011, Alcon Laboratories, Inc. (ALI) received a subpoena from the United States Department of Health & Human Services relating to an investigation into allegations of healthcare fraud, including potential off-label promotion of certain products. The subpoena requests the production of documents relating to marketing practices, including the remuneration of healthcare providers, in connection with surgical equipment and certain Novartis products (*Vigamox*, *Nevanac*, *Omnipred*, *Econopred*). ALI is cooperating with this investigation.

S.D.N.Y. Gilenya marketing practices investigation and litigation

In 2013, NPC received a civil investigative demand from the United States Attorney's Office (USAO) for the S.D.N.Y. requesting the production of documents and information relating to marketing practices for *Gilenya*, including the remuneration of healthcare providers in connection therewith. In 2017, S.D.N.Y. and New York State declined to intervene in claims raised by an individual relator in a *qui tam* complaint, which continue to be vigorously contested.

Government generic pricing antitrust investigations, antitrust class actions

Since 2016, Sandoz Inc. received grand jury subpoenas and a civil investigative demand and interrogatories from the Antitrust and Civil Divisions of the US Department of Justice (DoJ), and a subpoena and interrogatories from the Attorney General of the State of Connecticut in connection with alleged price fixing and market allocation of generic drugs in the US market as well as alleged FCA violations. The requests are for documents related to the marketing and pricing of generic pharmaceutical products sold by Sandoz Inc. and its subsidiaries, including Fougera Pharmaceuticals Inc. (Fougera), and related communications with competitors. Sandoz Inc. is cooperating with these investigations, which it believes to be part of a broader inquiry into industry practice.

Since the third quarter of 2016, Sandoz Inc. and Fougera have been sued alongside other generic pharmaceutical companies in more than 20 individual and putative class action complaints by direct and indirect purchasers and Attorneys General for 45 states, the District of Columbia and Puerto Rico. Plaintiffs claim that defendants, including Sandoz, engaged in price fixing and market allocation of generic drugs in the US market and seek damages and injunctive relief. The actions contain product-specific complaints as well as complaints alleging the existence of an over-arching industry conspiracy, and assert violations of federal and state antitrust laws as well as consumer protection laws. The cases have been consolidated for pretrial purposes in the USDC for the Eastern District of Pennsylvania (E.D. Pa.) and the claims are being vigorously contested.

Asia/Russia investigation

In 2017 and 2018, Alcon and Novartis Group companies, as well as certain present and former executives and associates of Alcon and Novartis, received document requests and subpoenas from the DoJ and the US Securities and Exchange Commission (SEC) requesting information concerning Alcon accounting, internal controls and business practices in Asia and Russia, including revenue recognition for surgical equipment and related products and services, as well as relationships with third-party distributors, both before and after Alcon became part of the Novartis Group. Alcon and Novartis are cooperating with this investigation. In case of approval of the Alcon spin-off, Novartis will indemnify Alcon in respect of defined direct monetary liabilities relating to the current scope of the ongoing investigation by the DoJ and the SEC relating to certain business practices in Asia and Russia and related accounting

treatment.

Lucentis/Avastin® matters

In connection with an investigation into whether Novartis Farma S.p.A., Novartis AG, F. Hoffmann-La Roche AG, Genentech Inc. and Roche S.p.A. colluded to artificially preserve the market positions of Avastin® and *Lucentis*, in 2014 the Italian Competition Authority imposed a fine equivalent to USD 125 million on Novartis AG and Novartis Farma S.p.A. Novartis paid the fine, subject to the right to later claim recoupment, and is appealing before the Consiglio di Stato. In 2014 and 2015, the Italian Ministry of Health and the Lombardia region sent letters with payment requests for a total equivalent of approximately USD 1.3 billion in damages from Novartis and Roche entities based on the above allegations. In 2019, the French Competition Authority issued a Statement of Objections against Novartis entities alleging anti-competitive practices on the French market for anti-vascular endothelial growth factor treatments for wet age-related macular degeneration from 2008 to 2013. Novartis continues to vigorously contest all claims in Italy and France. Also, Novartis is challenging policies and regulations allowing

off-label/unlicensed use and reimbursement for economic reasons in various countries, including in Italy, the UK, and Brazil.

Japan investigation

In 2015, a trial started against a former Novartis Pharma K.K. (NPKK) employee, and also NPKK under the dual liability concept in Japanese law, over allegations brought by the Tokyo District Public Prosecutor Office for alleged manipulation of data in sub-analysis publications of the Kyoto Heart Study regarding valsartan. The charges against NPKK are subject to a maximum total fine of JPY 4 million. In 2018, the Tokyo High Court upheld a not-guilty ruling of the Tokyo District Court for both the former NPKK employee and NPKK. A further appeal by the Tokyo District Public Prosecutor Office remains pending.

South Korea investigation

In 2016, the Seoul Western District Prosecutor initiated a criminal investigation into, among other things, allegations that Novartis Korea utilized medical journals to provide inappropriate economic benefits to HCPs. A criminal trial is ongoing.

Greece investigation

Novartis is investigating allegations of potentially inappropriate economic benefits to HCPs, government officials and others in Greece. Novartis is providing information to the Greek authorities investigating these allegations, including the Greek Coordinating Body for Inspection and Control and the Greek Body of Prosecution of Financial Crime, from which it received a summons in 2018. Novartis is also responding to a subpoena and document requests from the SEC and DoJ that it received in 2016 and 2017 in connection with such allegations and is cooperating with their investigation.

Antitrust class actions

Contact lenses

Since the first quarter of 2015, more than 50 class action complaints have been filed in several courts across the US naming as defendants contact-lens manufacturers, including ALI, and alleging violations of federal antitrust law as well as the antitrust, consumer protection and unfair competition laws of various states, in connection with the implementation of unilateral price policies by the defendants in the sale of contact lenses. The cases have been consolidated in the Middle District of Florida by the Judicial Panel on Multidistrict Litigation and the claims are being vigorously contested.

Enoxaparin

In 2015, Sandoz and Momenta Pharmaceuticals were sued in a putative antitrust class action in federal court in Tennessee alleging that Momenta and Sandoz engaged in anticompetitive and unfair business conduct with regard to sales of enoxaparin, and the same allegations were made by Amphastar in a lawsuit filed in federal court in California and subsequently moved to federal court in Massachusetts (Sandoz, Momenta Pharmaceuticals and Amphastar are currently engaged in patent litigation concerning enoxaparin). The claims are being vigorously contested.

Exforge

Since 2018, Novartis Group companies as well as other pharmaceutical companies were sued by various direct and indirect purchasers of *Exforge* in multiple US individual and putative class action complaints. They claim that Novartis made a reverse payment in the form of an agreement not to launch an authorized generic, alleging violations of federal antitrust law and state antitrust, consumer protection and common laws and seeking damages as well as injunctive relief. The cases have been consolidated in the S.D.N.Y. and the claims are being vigorously contested.

Product liability litigation

Reclast

NPC is a defendant in more than 20 US product liability actions involving *Reclast* and alleging atypical femur fracture injuries, all of which are in New Jersey state or federal court and in California state court coordinated with claims against other bisphosphonate manufacturers. The claims are being vigorously contested.

Taxotere® (docetaxel)

Sandoz is a defendant in more than 2 000 US product liability actions involving Taxotere® (docetaxel), an oncology product, many of which have been transferred to Multidistrict Litigation in the Eastern District of Louisiana. The complaints allege misleading marketing and that Sanofi, as innovator, and several 505(b)(2) NDA holders (including Sandoz) failed to warn of the risk of permanent alopecia/hair loss. The claims are being vigorously contested.

Amiodarone

Sandoz entities are named in more than 10 individual and multi-plaintiff US product liability cases involving amiodarone, a cardiac drug indicated to treat life-threatening arrhythmias that have not responded to other treatment. The complaints allege failure to warn, off-label promotion and failure to include medication guides to pharmacies. The claims are being vigorously contested.

Valsartan

Since 2018, claims have been brought against Sandoz and other pharmaceutical companies alleging injury from carcinogenic impurities found in valsartan and valsartan / HCT film-coated tablets marketed or manufactured by Sandoz, including several putative class actions in Canada. The claims are being vigorously contested.

Other matters

Average Wholesale Price (AWP) litigation

Lawsuits have been brought, the latest in February 2016, by various US state governmental entities and private parties against various pharmaceutical companies, including certain Sandoz entities and NPC, alleging that they fraudulently overstated the AWP that is or has been used by payors, including state Medicaid agencies, to calculate reimbursements to healthcare providers. NPC remains a defendant in an action brought by the state of Illinois and in a putative class action brought by private payors in New Jersey, and Sandoz remains a defendant in an individual action for declaratory judgment in Penn-

sylvania, which is considered concluded for reporting purposes. The claims are being vigorously contested.

IP matters

MIVS platform patent infringement litigation

In 2015, Johns Hopkins University filed a patent infringement lawsuit against certain Alcon entities alleging that the use of certain Alcon surgical products, principally by third parties, infringes a patent directed to certain methods of ocular surgery. The claims are being vigorously contested.

Concluded legal matters

District of Massachusetts (D. Mass.) charitable foundation investigation

In 2016 and 2017, NPC received subpoenas from the USAO for the D. Mass. requesting documents related to NPC's support of 501(c)(3) organizations that provide co-payment assistance to Medicare patients who are prescribed Novartis medicines, including the respective accounting and tax treatment, as well as related to pricing strategies for *Gleevec*, *Tasigna*, *Zometa*, and *Gilenya*. In 2018, NPC agreed to a settlement in principle to pay USD 23 million to resolve the investigation into potential violations of federal health care laws, including the Anti-Kickback Statute and FCA. This settlement is subject to mutually agreeable terms and finalization of the documentation. Novartis considers this matter concluded for the purpose of reporting legal proceedings.

Gleevec

In 2015 and 2016, Novartis Group companies were sued in putative antitrust class actions in the D. Mass. alleging delayed generic entry of *Gleevec* and seeking damages on behalf of direct and indirect purchasers of *Gleevec*. The motion to dismiss those actions was granted and was finally affirmed on appeal by the US Court of Appeals for the First Circuit in 2018. A similar class action that was filed in 2018 in E.D. Pa. on behalf of direct purchasers of *Gleevec* was voluntarily dismissed in the same year. The matters are therefore concluded.

Oriel litigation

In 2013, Shareholder Representative Services LLC filed a complaint in New York State Court against Sandoz Inc., two affiliates and two former officers of Sandoz AG asserting various common law and statutory contract, fraud and negligent misrepresentation claims arising out of Sandoz Inc.'s purchase of Oriel Therapeutics, Inc. In March 2015, the court dismissed all parties and claims but for a breach of contract claim against Sandoz Inc. In 2018, the remaining case was resolved through settlement, the payment of which was not material to Novartis.

Eye drop products consumer class actions

Plaintiffs alleged that Alcon's and Sandoz's eye drop products for glaucoma were unfairly designed so that the drop dosage is more than necessary and exceeds the capacity of the eye, leading to wastage and higher costs to patient consumers. In 2018, the remaining cases against Alcon and Sandoz in New Jersey and Missouri were voluntarily dismissed with prejudice by plaintiffs, in exchange for defendants' agreement not to pursue statutory costs, and the Massachusetts case was finally dismissed upon appeal by the Court of Appeals for the First Circuit.

Summary of product liability, governmental investigations and other legal matters provision movements

(USD millions)	2018	2017	2016
January 1	351	395	1 194
Cash payments	– 118	– 69	– 811
Releases of provisions	– 107	– 70	– 239
Additions to provisions	220	93	243
Currency translation effects	– 6	2	8
December 31	340	351	395
Less current portion	– 126	– 121	– 131
Non-current product liabilities, governmental investigations and other legal matters provisions at December 31	214	230	264

Novartis believes that its total provisions for investigations, product liability, arbitration and other legal matters are adequate based upon currently available information. However, given the inherent difficulties in estimating liabilities, there can be no assurance that additional liabilities and costs will not be incurred beyond the amounts provided.

20. Current financial debt and derivative financial instruments

(USD millions)	2018	2017
Interest-bearing accounts of associates payable on demand [1]	1 778	1 822
Bank and other financial debt [2]	701	692
Commercial paper	3 951	2 328
Current portion of non-current financial debt	3 190	359
Fair value of derivative financial instruments	58	107
Total current financial debt and derivative financial instruments	9 678	5 308

[1] Weighted average interest rate 0.5% (2017: 0.5%)

[2] Weighted average interest rate 9.6% (2017: 7.0%)

The consolidated balance sheet amounts of current financial debt, other than the current portion of non-current financial debt, approximate the estimated fair value due to the short-term nature of these instruments.

Details on commercial papers are provided under “Liquidity risk” in Note 28.

21. Provisions and other current liabilities

(USD millions)	2018	2017
Taxes other than income taxes	528	660
Restructuring provisions	507	153
Accrued expenses for goods and services received but not invoiced	970	977
Accruals for royalties	651	586
Accrued interests on financial debt	156	145
Provisions for deductions from revenue	5 262	4 672
Accruals for compensation and benefits including social security	2 527	2 327
Environmental remediation liabilities	58	55
Deferred income	236	305
Provisions for product liabilities, governmental investigations and other legal matters [1]	126	121
Accrued share-based payments	273	261
Contingent considerations [2]	33	44
Commitment for repurchase of own shares [3]	284	
Other payables	673	897
Total provisions and other current liabilities	12 284	11 203

[1] Note 19 provides additional disclosures related to legal provisions.

[2] Note 28 provides additional disclosures related to contingent considerations.

[3] Note 17 provides additional disclosures related to commitment for repurchase of own shares.

Provisions are based upon management’s best estimate and adjusted for actual experience. Such adjustments to the historic estimates have not been material.

Provisions for deductions from revenue

The following table shows the movement of the provisions for deductions from revenue:

				Income statement charge			
(USD millions)	Revenue deductions provisions at January 1	Effect of currency translation and business combinations	Payments/ utilizations	Adjustments of prior years	Current year	Change in provisions offset against gross trade receivables	Revenue deductions provisions at December 31
2018							
US-specific healthcare plans and program rebates	1 590		– 4 158	– 90	4 541		1 883
Non-US-specific healthcare plans and program rebates	1 356	– 78	– 2 182	83	2 555	– 109	1 625
Non-healthcare plans and program-related rebates, returns and other deductions	1 726	– 51	– 12 227	– 91	11 956	441	1 754
Total 2018	4 672	– 129	– 18 567	– 98	19 052	332	5 262
2017							
US-specific healthcare plans and program rebates	1 461		– 3 684	– 62	3 875		1 590
Non-US-specific healthcare plans and program rebates	1 020	131	– 1 954	80	2 186	– 107	1 356
Non-healthcare plans and program-related rebates, returns and other deductions	1 702	65	– 11 814	– 127	12 045	– 145	1 726
Total 2017	4 183	196	– 17 452	– 109	18 106	– 252	4 672
2016							
US-specific healthcare plans and program rebates	1 165		– 3 203	7	3 492		1 461
Non-US-specific healthcare plans and program rebates	1 024	– 31	– 1 844	– 26	1 883	14	1 020
Non-healthcare plans and program-related rebates, returns and other deductions	1 601	– 19	– 11 142	– 117	11 383	– 4	1 702
Total 2016	3 790	– 50	– 16 189	– 136	16 758	10	4 183

Restructuring provisions movements

(USD millions)	2018	2017	2016
January 1	153	222	260
Additions	534	194	343
Cash payments	– 145	– 200	– 260
Releases	– 33	– 64	– 66
Transfers		– 7	– 76
Currency translation effects	– 2	8	21
December 31	507	153	222

In 2018, additions to provisions of USD 534 million were mainly related to the following reorganizations:

• The Innovative Medicines Division's Oncology business unit initiative to streamline its organizational structure. The objective was to enhance agility and efficiency, resulting in an acceleration of operational execution. In addition, a program to reorganize the Japanese business model was launched. Region Europe transformed its approach to market in light of the changing product portfolio. The objective is to speed up patient access.

• Novartis Business Services launched an initiative to reorganize its organizational structure to achieve cost efficiencies by shifting activities to global service centers.

• Group-wide initiatives to streamline Novartis Technical Operations and implement new technologies, mainly in the Innovative Medicines Division but also in the Sandoz Division, continued.

In 2017, additions to provisions of USD 194 million were mainly related to the following reorganizations:

• The Innovative Medicines Division's Pharmaceuticals business unit adjusted a regional promotional model, which led to a restructuring of the sales force. It also streamlined the above country operating model to facilitate an even higher external competition-oriented focus. Furthermore, the development organization streamlined its activities to create efficiencies.

• The Alcon Division continued initiatives to realign its operations to focus on the Surgical and Vision Care businesses after the Ophthalmic Pharmaceuticals business transfer to the Innovative Medicines Division.

• The Sandoz Division launched initiatives to focus resources to gain efficiencies.

• Group-wide initiatives to streamline Novartis Technical Operations in the Innovative Medicines and Sandoz Divisions were launched.

In 2016, additions to provisions of USD 343 million were mainly related to the following reorganizations:

• The Innovative Medicines Division's Pharmaceuticals business unit realigned its operations to improve its operating agility, to focus resources on key growth drivers. Furthermore, research realigned and focused its

operations, resulting in redundancies from the consolidation of certain research teams and the outsourcing of certain activities to qualified third-party vendors.

• The Alcon Division launched several initiatives to improve its efficiencies, resulting in redundancies, as it realigned its operations to focus on its Surgical and Vision Care business franchises after the transfer of its Ophthalmic Pharmaceuticals business to the Innovative Medicines Division.

• The Sandoz Division launched an initiative to reallocate resources to priority, high-growth and higher profitability countries.

• Various Group-wide initiatives to simplify organizational structure, including the consolidation of manufacturing sites and support services.

22. Details to the consolidated statements of cash flows

22.1) Reversal of non-cash items and other adjustments

(USD millions)	2018	2017	2016
Depreciation, amortization and impairments on:			
Property, plant and equipment	2 021	1 677	1 591
Intangible assets	4 871	4 399	4 452
Financial assets [1]	– 11	256	132
Non-cash change in provisions and other non-current liabilities	876	160	956
Gains on disposal and other adjustments on property, plant and equipment; intangible assets; financial assets; and other non-current assets, net	– 900	– 1 043	– 935
Equity-settled compensation expense	759	683	671
Income from associated companies [2]	– 6 438	– 1 108	– 703
Taxes	1 221	1 296	1 119
Net financial expense	772	738	1 154
Total	3 171	7 058	8 437

[1] Includes fair value adjustments

[2] 2018 includes a reversal of a pre-tax gain (USD 5.8 billion) recognized from the divestment of the investment in GSK Consumer Healthcare Holdings Ltd. (see Note 2). The net cash proceed of USD 13.0 billion from the divestment is included in the consolidated statements of cash flows in line "Divestments and acquisitions of interests in associated companies, net."

22.2) Cash flows from changes in working capital and other operating items included in the net cash flows from operating activities

(USD millions)	2018	2017	2016
(Increase) in inventories	– 533	– 247	– 235
(Increase) in trade receivables	– 569	– 204	– 229
Increase/(decrease) in trade payables	309	58	– 587
Change in other current assets	403	– 180	460
Change in other current liabilities	891	816	505
Other adjustments, net	– 2	1	9
Total	499	244	– 77

22.3) Cash flows arising from divestments and acquisitions of interests in associated companies

In 2018, divestments and acquisitions of interests in associated companies included USD 12 855 million net of taxes (USD 12 994 million before taxes) from the divestment of the investment in GSK Consumer Healthcare Holdings Ltd. (see Note 2).

22.4) Cash flows arising from acquisitions and divestments of businesses

The following is a summary of the cash flow impact of acquisitions and divestments. The most significant transactions are described in Note 2.

(USD millions)	Note	2018	2017	2016
Net assets recognized as a result of business combinations	23	– 13 946	– 999	– 869
Fair value of previously held equity interests				64
Receivables and payables contingent consideration, net [1]		41	206	84
Other payments and deferred consideration, net		– 35	– 36	– 44
Cash flows used for acquisitions of businesses		– 13 940	– 829	– 765
Cash flows from divestments of businesses [2]		18	45	
Cash flows used for acquisitions and divestments of businesses, net		– 13 922	– 784	– 765

[1] The contingent consideration of the 2016 Transcend Medical, Inc. acquisition amounted to USD 92 million. Of this amount, USD 60 million was paid in 2016.

[2] In 2018, USD 18 million represents the net cash inflows from previous years divestments. In 2017, the USD 45 million primarily relates to the net identifiable assets of a divested business of USD 48 million, comprised of non-current assets of USD 29 million, current assets of USD 34 million partly offset by current liabilities of USD 15 million.

Notes 2 and 23 provide further information regarding acquisitions and divestments of businesses. All acquisitions were for cash.

22.5) Cash flows used in investing activities from discontinued operations

In 2015, Novartis completed a series of portfolio transformation transactions, including the divestments of its Animal Health and Vaccines businesses. In addition, a combined consumer healthcare business was created through the combination of the Novartis OTC and GlaxoSmithKline (GSK) Consumer Healthcare businesses. On March 2, 2015, a new entity, GlaxoSmithKline Consumer Healthcare Holdings Ltd. (GSK Consumer Healthcare), was formed via the contribution of businesses from both Novartis and GSK. Novartis had a 36.5% interest in the newly created entity. To reflect these transactions, Novartis reported the Group's financial results in 2015 as "continuing operations" and "discontinued operations." The net cash outflows used in discontinued operations in the years 2017 (USD 140 million) and 2016 (USD 748 million) includes portfolio transformation transactional payments related to the divested businesses. The Group's interest in GSK Consumer Healthcare was sold to GSK on June 1, 2018 (see Notes 2 and 4).

22.6) Reconciliation of liabilities arising from financing activities

(USD millions)	Non-current financial debts	Current financial debts and derivative financial instruments	Total
January 1, 2018	23 224	5 308	28 532
Increase in non-current financial debts	2 856		2 856
Repayment of non-current financial debts		– 366	– 366
Change in current financial debts		1 681	1 681
Impact of business combinations	10	4	14
Changes in fair values, and other changes	5	– 48	– 43
Amortization of bonds discount	27	2	29
Currency translation effects	– 462	– 93	– 555
Current portion of non-current financial debt	– 3 190	3 190	
December 31, 2018	22 470	9 678	32 148

(USD millions)	Non-current financial debts	Current financial debts and derivative financial instruments	Total
January 1, 2017	17 897	5 905	23 802
Increase in non-current financial debts	4 933		4 933
Repayment of non-current financial debts	– 1	– 187	– 188
Change in current financial debts		– 755	– 755
Changes in fair values, and other changes	– 6	– 140	– 146
Amortization of bonds discount	16		16
Currency translation effects	744	126	870
Current portion of non-current financial debt	– 359	359	
December 31, 2017	23 224	5 308	28 532

23. Acquisitions of businesses

Fair value of assets and liabilities arising from acquisitions

(USD millions)	2018	2017	2016
Property, plant and equipment	137		
Currently marketed products	2 531		451
Acquired research and development	10 224	1 223	690
Other intangible assets	1		
Deferred tax assets	381	8	39
Financial and other assets	19		
Inventories	20		4
Trade receivables and other current assets	90		1
Cash and cash equivalents	1 112	20	1
Deferred tax liabilities	– 2 874	– 325	– 372
Current and non-current financial debts	– 14		
Trade payables and other liabilities	– 627	– 1	
Net identifiable assets acquired	11 000	925	814
Acquired liquidity	– 1 112	– 20	– 1
Non-controlling interests	– 26		
Goodwill	4 084	94	56
Net assets recognized as a result of business combinations	13 946	999	869

Note 2 details significant acquisitions of businesses, specifically, AAA, AveXis and Endocyte in 2018, Ziarco and Encore in 2017, and Transcend and Reprixys in 2016. The goodwill arising out of these acquisitions is attributable to the growth platform, the assembled workforce, and the accounting for deferred tax liabilities on the acquired assets. No goodwill from 2018 and 2017 is tax-deductible. Goodwill of USD 18 million from 2016 is tax deductible.

24. Post-employment benefits for associates

Defined benefit plans

In addition to the legally required social security schemes, the Group has numerous independent pension and other post-employment benefit plans. In most cases, these plans are externally funded in entities that are legally separate from the Group. For certain Group companies, however, no independent plan assets exist for the pension and other post-employment benefit obligations of associates. In these cases the related unfunded liability is included in the balance sheet. The defined benefit obligations (DBOs) of all major pension and other post-employment benefit plans are reappraised annually by independent actuaries. Plan assets are recognized at fair value. The major plans are based in Switzerland, the United States, the United Kingdom, Germany and Japan, which represent 94%of the Group's total DBO for pension plans. Details of the plans in the two most significant countries of Switzerland and the United States, which represent 80%of the Group's total DBO for post-employment benefit plans, are provided below.

Swiss-based pension plans represent the most significant portion of the Group's total DBO and plan assets. For the active insured members born on or after January 1, 1956, or having joined the plans after December 31, 2010, the benefits are partially linked to the contributions paid into the plan. Certain features of Swiss pension plans required by law preclude the plans being categorized as defined contribution plans. These factors include a minimum interest guarantee on retirement savings accounts, a pre-determined factor for converting the accumulated savings account balance into a pension, and embedded death and disability benefits.

All benefits granted under Swiss-based pension plans are vested, and Swiss legislation prescribes that the employer has to contribute a fixed percentage of an associate's pay to an external pension fund. Additional employer contributions may be required whenever the plan's statutory funding ratio falls below a certain level. The associate also contributes to the plan. The pension plans are run by separate legal entities, each governed by a board of trustees that – for the principal plans – consists of representatives nominated by Novartis and the active insured associates. The boards of trustees are responsible for the plan design and asset investment strategy.

In September 2017, the pension regulations in Switzerland were amended, which resulted in a change in accounting from defined benefit to defined contribution for a component of the Swiss pension plans. This change resulted in a reduction to the defined benefit pension plans liability and in a corresponding net pre-tax gain of USD 225 million (CHF 216 million).

The United States pension plans represent the second largest component of the Group's total DBO and plan assets. The principal plans (Qualified Plans) are funded, whereas plans providing additional benefits for executives (Restoration Plans) are unfunded. Employer contributions are required for Qualified Plans whenever the statutory funding ratio falls below a certain level.

Furthermore, in certain countries, associates are covered under other post-employment benefit plans and post-retirement medical plans.

In the US, other post-employment benefit plans consist primarily of post-employment healthcare benefits, which have been closed to new members since 2015. Part of the costs of these plans is reimbursable under the Medicare Prescription Drug, Improvement, and Modernization Act of 2003. There is no statutory funding requirement for these plans. The Group is funding these plans to the extent that it is tax efficient.

The following tables are a summary of the funded and unfunded defined benefit obligation for pension and other postemployment benefit plans of associates at December 31, 2018 and 2017:

	Pension plans		Other post-employment benefit plans	
(USD millions)	2018	2017	2018	2017
Benefit obligation at January 1	23 210	23 614	1 115	1 158
Current service cost	378	422	34	34
Interest cost	321	330	39	44
Past service costs and settlements	– 1	– 1 226		– 10
Administrative expenses	26	27		
Remeasurement (gains)/losses arising from changes in financial assumptions	– 567	11	– 31	32
Remeasurement losses/(gains) arising from changes in demographic assumptions	5	– 26	1	– 9
Experience-related remeasurement losses/(gains)	264	47	– 32	– 87
Currency translation effects	– 374	1 138	– 7	5
Benefit payments	– 1 263	– 1 300	– 46	– 51
Contributions of associates	169	207		
Effect of acquisitions, divestments or transfers	11	– 34		– 1
Benefit obligation at December 31	22 179	23 210	1 073	1 115
Fair value of plan assets at January 1	20 275	19 225	162	153
Interest income	249	236	5	5
Return on plan assets excluding interest income	– 805	1 429	– 8	12
Currency translation effects	– 310	909		
Novartis Group contributions	520	579	6	43
Contributions of associates	169	207		
Settlements	– 3	– 995		
Benefit payments	– 1 263	– 1 300	– 46	– 51
Effect of acquisitions, divestments or transfers	6	– 15		
Fair value of plan assets at December 31	18 838	20 275	119	162
Funded status	– 3 341	– 2 935	– 954	– 953
Limitation on recognition of fund surplus at January 1	– 89	– 54		
Change in limitation on recognition of fund surplus (incl. exchange rate differences)	25	– 30		
Interest income on limitation of fund surplus	– 4	– 5		
Limitation on recognition of fund surplus at December 31	– 68	– 89		
Net liability in the balance sheet at December 31	– 3 409	– 3 024	– 954	– 953

The reconciliation of the net liability from January 1 to December 31 is as follows:

	Pension plans		Other post-employment benefit plans	
(USD millions)	2018	2017	2018	2017
Net liability at January 1	– 3 024	– 4 443	– 953	– 1 005
Current service cost	– 378	– 422	– 34	– 34
Net interest expense	– 76	– 99	– 34	– 39
Administrative expenses	– 26	– 27		
Past service costs and settlements	– 2	231		10
Remeasurements	– 507	1 397	54	76
Currency translation effects	64	– 229	7	– 5

Novartis Group contributions	520	579	6	43
Effect of acquisitions, divestments or transfers	– 5	19		1
Change in limitation on recognition of fund surplus	25	– 30		
Net liability at December 31	– 3 409	– 3 024	– 954	– 953
Amounts recognized in the consolidated balance sheet				
Prepaid benefit cost	137	133		
Accrued benefit liability	– 3 546	– 3 157	– 954	– 953

The following table shows a breakdown of the DBO for pension plans by geography and type of member, and the breakdown of plan assets into the geographical locations in which they are held:

	2018				2017			
(USD millions)	Switzerland	United States	Rest of the world	Total	Switzerland	United States	Rest of the world	Total
Benefit obligation at December 31	14 263	3 348	4 568	22 179	14 606	3 788	4 816	23 210
Thereof unfunded		649	491	1 140		728	499	1 227
By type of member								
Active	5 618	653	1 616	7 887	5 627	796	1 646	8 069
Deferred pensioners		1 131	1 531	2 662		1 258	1 646	2 904
Pensioners	8 645	1 564	1 421	11 630	8 979	1 734	1 524	12 237
Fair value of plan assets at December 31	13 470	2 160	3 208	18 838	14 445	2 400	3 430	20 275
Funded status	– 793	– 1 188	– 1 360	– 3 341	– 161	– 1 388	– 1 386	– 2 935

The following table shows a breakdown of the DBO for other post-employment benefit plans by geography and type of member, and the breakdown of plan assets into the geographical locations in which they are held:

	2018			2017		
(USD millions)	United States	Rest of the world	Total	United States	Rest of the world	Total
Benefit obligation at December 31	1 001	72	1 073	1 036	79	1 115
Thereof unfunded	882	72	954	874	79	953
By type of member						
Active	270	25	295	310	26	336
Deferred pensioners	18	0	18	20	0	20
Pensioners	713	47	760	706	53	759
Fair value of plan assets at December 31	119	0	119	162	0	162
Funded status	– 882	– 72	– 954	– 874	– 79	– 953

The following table shows the principal weighted average actuarial assumptions used for calculating defined benefit plans and other post-employment benefits of associates:

	Pension plans			Other post-employment benefit plans		
	2018	2017	2016	2018	2017	2016
Weighted average assumptions used to determine benefit obligations at December 31						
Discount rate	1.6%	1.5%	1.4%	4.4%	3.7%	4.2%
Expected rate of pension increase	0.4%	0.5%	0.4%			
Expected rate of salary increase	2.8%	2.8%	2.2%			
Interest on savings account	0.8%	0.6%	0.5%			
Current average life expectancy for a 65-year-old male in years	22	22	22	21	21	21
Current average life expectancy for a 65-year-old female in years	24	24	24	23	23	23

Changes in the aforementioned actuarial assumptions can result in significant volatility in the accounting for the Group’s pension plans in the consolidated financial statements. This can result in substantial changes in the Group’s other comprehensive income, long-term liabilities and prepaid pension assets.

The DBO is significantly impacted by assumptions regarding the rate that is used to discount the actuarially

determined post-employment benefit liability. This rate is based on yields of high-quality corporate bonds in the country of the plan. Decreasing corporate bond yields decrease the discount rate, so that the DBO increases and the funded status decreases.

In Switzerland, an increase in the DBO due to lower discount rates is slightly offset by lower future benefits expected to be paid on the associate's savings account where the assumption on interest accrued changes in line with the discount rate.

The impact of decreasing interest rates on a plan's assets is more difficult to predict. A significant part of the plan assets is invested in bonds. Bond values usually rise when interest rates decrease and may therefore partially compensate for the decrease in the funded status. Furthermore, pension assets also include significant holdings of equity instruments. Share prices tend to rise when interest rates decrease and therefore often coun-

teract the negative impact of the rising defined benefit obligation on the funded status (although the correlation of interest rates with equities is not as strong as with bonds, especially in the short term).

The expected rate for pension increases significantly affects the DBO of most plans in Switzerland, Germany and the United Kingdom. Such pension increases also decrease the funded status, although there is no strong correlation between the value of the plan assets and pension/inflation increases.

Assumptions regarding life expectancy significantly impact the DBO. An increase in longevity increases the DBO. There is no offsetting impact from the plan assets, as no longevity bonds or swaps are held by the pension funds. Generational mortality tables are used where this data is available.

The following table shows the sensitivity of the defined benefit pension obligation to the principal actuarial assumptions for the major plans in Switzerland, the United States, the United Kingdom, Germany and Japan on an aggregated basis:

(USD millions)	Change in 2018 year-end defined benefit pension obligation
25 basis point increase in discount rate	– 718
25 basis point decrease in discount rate	762
1 year increase in life expectancy	803
25 basis point increase in rate of pension increase	502
25 basis point decrease in rate of pension increase	– 133
25 basis point increase of interest on savings account	56
25 basis point decrease of interest on savings account	– 55
25 basis point increase in rate of salary increase	46
25 basis point decrease in rate of salary increase	– 47

The healthcare cost trend rate assumptions used for other post-employment benefits are as follows:

	2018	2017	2016
Healthcare cost trend rate assumed for next year	7.0%	6.5%	7.0%
Rate to which the cost trend rate is assumed to decline	4.5%	4.5%	5.0%
Year that the rate reaches the ultimate trend rate	2028	2025	2022

The following table shows the weighted average plan asset allocation of funded defined benefit pension plans at December 31, 2018 and 2017:

	Pension plans			
(as a percentage)	Long-term target minimum	Long-term target maximum	2018	2017
Equity securities	15	40	28	31
Debt securities	20	60	35	35
Real estate	5	20	17	15
Alternative investments	0	20	16	15
Cash and other investments	0	15	4	4
Total			100	100

Cash and most of the equity and debt securities have a quoted market price in an active market. Real estate and alternative investments, which include hedge fund, private equity, infrastructure and commodity investments, usually have a quoted market price or a regularly updated net asset value.

The strategic allocation of assets of the different pension plans is determined with the objective of achieving an investment return that, together with the contributions paid by the Group and its associates, is sufficient to maintain reasonable control over the various funding risks of the plans. Based upon the market and economic environments, actual asset allocations may temporarily be permitted to deviate from policy targets. The asset allocation currently includes investments in shares of Novartis AG as per the below table:

	December 31, 2018	December 31, 2017
Investment in shares of Novartis AG		
Number of shares (in millions)	11.0	11.0
Market Value (in USD billions)	0.9	0.9

The weighted average duration of the defined benefit obligation is 14.6 years (2017: 14.6 years).

The Group's ordinary contribution to the various pension plans is based on the rules of each plan. Additional contributions are made whenever this is required by statute or law (i.e., usually when statutory funding levels fall below predetermined thresholds). The only significant plans that are foreseen to require additional funding are those in the United Kingdom.

The expected future cash flows in respect of pension and other post-employment benefit plans at December 31, 2018, were as follows:

(USD millions)	Pension plans	Other post-employment benefit plans
Novartis Group contributions		
2019 (estimated)	436	65
Expected future benefit payments		
2019	1 146	66
2020	1 135	69
2021	1 130	71
2022	1 119	73
2023	1 109	74
2024–2028	5 444	366

Defined contribution plans

In many subsidiaries, associates are covered by defined contribution plans. Contributions charged to the consolidated income statement for the defined contribution plans were:

(USD millions)	2018	2017	2016
Contributions for defined contribution plans	547	406	338

25. Equity-based participation plans for associates

The expense related to all equity-based participation plans and the liabilities arising from equity-based payment transactions were as follows:

(USD millions)	2018	2017	2016
Expense related to equity-based participation plans	1 011	924	846
Liabilities arising from equity-based payment transactions	273	261	199

Equity-based participation plans can be separated into the following plans:

Annual Incentive

The Annual Incentive for the Novartis Group CEO and other Executive Committee members is paid 50% in cash and 50% in Novartis restricted shares (RSs) or restricted share units (RSUs). For the Novartis Top Leaders (NTLs), the Annual Incentive is paid 70% in cash and 30% in RSs or RSUs. Cash is paid out during February or March in the year following the end of the performance period, and the shares are granted during January in the year following the end of the performance period.

Share savings plans

Associates in certain countries and certain key executives worldwide are encouraged to invest their Annual Incentive, and in the United Kingdom specifically, also their base salary in a share savings plan.

Under the share savings plan, participants may elect to receive their relevant compensation fully or partially in Novartis shares in lieu of cash. As a reward for their participation in the share savings plan, at no additional cost to the participant, Novartis matches their investments in shares after a holding period of three or five years.

Novartis operates three share savings plans, and associates may only participate in one of the share savings plans in any given year:

• In Switzerland, Employee Share Ownership Plan (ESOP) participants may choose to receive their Annual Incentive (i) 100% in shares, (ii) 50% in shares and 50% in cash, or (iii) 100% in cash. After expiration of a three-year holding period for Novartis shares invested under the ESOP, participants will receive one matching share for every two invested shares. Associates eligible for the equity plan “Select” are not eligible to receive ESOP matching shares starting with the 2017 performance period.

• In the United Kingdom, associates can invest up to 10% of their monthly salary in shares (up to a maximum of GBP 150) and may also be invited to invest their net Annual Incentive in shares. Two invested shares are matched with one share with a holding period of three years. Starting with the 2017 performance period, United Kingdom associates can only invest a maximum of 50% of their Annual Incentive in shares, and this option is no longer offered to associates who are eligible for the equity plan “Select.”

• The Leveraged Share Savings Plan (LSSP) was available to key executives for performance periods prior to 2016. At the participant’s election, the Annual Incentive was awarded partly or entirely in shares. The elected number of shares is subject to a holding period of five years. At the end of the holding period, Novartis will match the invested shares at a ratio of 1-to-1 (i.e., one share awarded for each invested share). In the United States, both the LSSP award and the corresponding match are cash settled.

Following the introduction of the new compensation programs in 2014, the Novartis Group CEO and the other Executive Committee members are no longer eligible to participate in the share savings plans. From the 2016 performance period onward, the NTLs are also no longer eligible to participate in the share savings plans.

Novartis equity plan “Select”

The equity plan “Select” is a global equity incentive plan under which eligible associates may annually be awarded a grant subject to a three-year vesting period. No awards are granted for performance ratings below a certain threshold. Executive Committee members are not eligible for participation in the equity plan “Select” effective from the performance period 2014, and the NTLs are not eligible to participate effective from the performance period 2016.

The equity plan “Select” currently allows participants in Switzerland to choose the form of their equity compensation in RSs or RSUs. In all other jurisdictions, RSUs are typically granted. Until 2013, participants could also choose to receive part or the entire grant in the form of tradable share options.

Tradable share options expire on their 10th anniversary from the grant date. Each tradable share option entitles the holder to purchase after vesting (and before the 10th anniversary from the grant date) one Novartis share at a stated exercise price that equals the closing market price of the underlying share at the grant date.

Options under Novartis equity plan “Select” outside North America

The following table shows the activity associated with the share options during the period. The weighted aver-
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age prices in the table below are translated from Swiss francs into USD at historical rates.

	2018		2017	
	Options (millions)	Weighted average exercise price (USD)	Options (millions)	Weighted average exercise price (USD)
Options outstanding at January 1	7.4	59.5	9.5	59.4
Sold or exercised	– 1.8	58.2	– 2.1	59.2
Outstanding at December 31	5.6	59.9	7.4	59.5
Exercisable at December 31	5.6	59.9	7.4	59.5

All share options were granted at an exercise price that was equal to the closing market price of the Group's shares at the grant date. The weighted average share price at the dates of sale or exercise was USD 73.1.

The following table summarizes information about share options outstanding at December 31, 2018:

						Total/ Weighted averagee
Options outstanding						
Number outstanding (millions)	0.3	0.9	0.8	1.3	2.3	5.6
Remaining contractual life (years)	0	1	2	3	4	2
Exercise price (USD)	46.7	54.5	57.0	57.6	66.0	59.9

Options under Novartis equity plan "Select" for North America

The following table shows the activity associated with the American Depositary Receipt (ADR) options during the period:

	2018		2017	
	ADR options (millions)	Weighted average exercise price (USD)	ADR options (millions)	Weighted average exercise price (USD)
Options outstanding at January 1	20.3	59.9	25.9	59.9
Sold or exercised	– 5.1	57.4	– 5.6	59.9
Outstanding at December 31	15.2	60.7	20.3	59.9
Exercisable at December 31	15.2	60.7	20.3	59.9

All ADR options were granted at an exercise price that was equal to the closing market price of the ADRs at the grant date. The weighted average ADR price at the dates of sale or exercise was USD 86.7.

The following table summarizes information about ADR options outstanding at December 31, 2018:

						Total/ Weighted averagee
ADR options outstanding						
Number outstanding (millions)	0.5	1.7	1.8	4.5	6.7	15.2
Remaining contractual life (years)	0	1	2	3	4	3
Exercise price (USD)	46.4	53.7	57.1	58.3	66.1	60.7

Long-Term Performance Plan

The Long-Term Performance Plan (LTPP) is an equity plan for the Novartis Group CEO, the other Executive Committee members and the NTLs. For the 2018 grant, the target incentive is 200% of base salary for the Novartis Group CEO, and ranges from 130% to 170% of base salary for other Executive Committee members. For the NTLs, the target incentive ranges from 20% to 160% of base salary.

The LTPP awards are based on three-year performance objectives focused on financial and innovation measures. The financial measure is Novartis Cash Value Added (NCVA). The weighting of this measure is 75%. The NCVA target is

approved by the Board of Directors.

The innovation measure is based on a holistic approach under which Group-wide innovation targets are set at the beginning of the cycle, representing the most important research and development project milestones across the Group. The weighting of this measure is 25%. At the end of the performance period, the Research & Development Committee assists the Board of Directors and the Compensation Committee in evaluating performance against the innovation targets at the end of the cycle.

Under the LTPP, participants are granted a target number of performance share units (PSUs) at the beginning of every performance period, which are converted into unrestricted Novartis shares after the performance period. Payout is between 0% and 200% of target. PSUs granted under the LTPP do not carry voting rights, but do carry dividend equivalents that are paid in shares at the end of the performance period.

Long-Term Relative Performance Plan

The Long-Term Relative Performance Plan (LTRPP) is an equity plan for the Novartis Group CEO, other Executive Committee members and NTLs. For the 2018 grant, the target incentive is 125% of base compensation for the Novartis Group CEO, and ranges from 30% to 80% for other Executive Committee members. For the NTLs, the target incentive range is from 10% to 40% of base compensation. The LTRPP is based on a ranking of the Novartis total shareholder return (TSR) relative to a global healthcare peer group of twelve companies until 2016, and 15 companies from 2017, over rolling three-year performance periods.

TSR for Novartis and the peer companies is calculated as the change in the company share price, which is translated to USD at the respective exchange rate, including the reinvestment return of dividends, over the three-year performance period. The calculation is based on Bloomberg standard published TSR data, which is publicly available. The position of Novartis in the peer group determines the payout range based on a payout matrix. Under the LTRPP, participants are also granted a target number of PSUs at the beginning of every performance period, which are converted into unrestricted Novartis shares after the performance period. Payout is between 0% and 200% of target. PSUs under the LTRPP do not carry voting rights, but do carry dividend equivalents that are paid in shares at the end of the performance period.

Other share awards

Selected associates, excluding the Executive Committee members, may exceptionally receive Special Share Awards of RSs or RSUs. These Special Share Awards provide an opportunity to reward outstanding achievements or exceptional performance, and aim to retain key contributors. They are based on a formal internal selection process, through which the individual performance of each candidate is thoroughly assessed at several management levels. Special Share Awards have a minimum three-year vesting period. In exceptional circumstances, Special Share Awards may be awarded to attract special expertise and new talents to the organization. These grants are consistent with market practice and the Novartis philosophy to attract, retain and motivate best-in-class talents around the world. Worldwide, associates at different levels in the organization were awarded RSs and RSUs in 2018.

In addition, in 2018, Board members received unrestricted shares as part of their regular compensation.

Summary of non-vested share movements

The table below provides a summary of non-vested share movements (RSs, RSUs and PSUs) for all plans:

	2018			2017		
	Number of shares in millions	Weighted average fair value at grant date in USD	Fair value at grant date in USD millions	Number of shares in millions	Weighted average fair value at grant date in USD	Fair value at grant date in USD millions
Non-vested shares at January 1	23.9	80.6	1 926	21.0	89.5	1 880
Granted						
– Annual incentive	1.3	83.9	109	1.3	69.3	90
– Share savings plans	4.1	84.9	348	4.5	69.4	312
– Select North America	3.9	77.8	303	4.5	64.1	288
– Select outside North America	2.1	79.7	167	2.0	65.3	131
– Long-Term Performance Plan	1.5	85.8	129	1.4	71.5	100
– Long-Term Relative Performance Plan	0.3	52.0	16	0.4	47.7	19
– Other share awards	1.2	77.9	93	1.3	67.8	88
Vested	– 10.7	90.2	– 965	– 10.7	78.2	– 837
Forfeited	– 1.9	76.4	– 145	– 1.8	80.7	– 145
Non-vested shares at December 31	25.7	77.1	1 981	23.9	80.6	1 926

Alcon, Inc., equity plans granted to associates prior to the merger

At the completion of the merger of Alcon, Inc. into Novartis on April 8, 2011, all awards outstanding under the Alcon equity plans were converted into awards based upon Novartis shares with a conversion factor of 3.0727, as defined in the merger agreement. The plans are fully vested.

Share options entitle the recipient to purchase Novartis shares at the closing market price of the former Alcon, Inc., share on the day of grant divided by the conversion factor.

Share-settled appreciation rights (SSAR) entitle the participant to receive, in the form of Novartis shares, the difference between the values of the former Alcon, Inc. share at the date of grant, converted into Novartis shares using the conversion factor, and the Novartis share price at the date of exercise.

Both options and SSARs expire on their 10th anniversary. The last grant was made in 2009, so that only a small residual number of instruments is outstanding as per the end of December 2018.

26. Transactions with related parties

Genentech/Roche

Novartis has two agreements with Genentech, Inc., United States, a subsidiary of Roche Holding AG, which is indirectly included in the consolidated financial statements using equity accounting since Novartis holds 33.3% of the outstanding voting shares of Roche (see Note 4).

Lucentis

Novartis has licensed the exclusive rights to develop and market *Lucentis* outside the United States for indications related to diseases of the eye. As part of this agreement, Novartis paid Genentech/Roche an initial milestone and shared the cost for the subsequent development by making additional milestone payments upon the achievement of certain clinical development points and product approval. Novartis also pays royalties on the net sales of *Lucentis* products outside the United States. In 2018, *Lucentis* sales of USD 2.0 billion (2017: USD 1.9 billion, 2016: USD 1.8 billion) were recognized by Novartis.

Xolair

In February 2004, Novartis Pharma AG, Genentech, Inc. and Tanox, Inc. finalized a three-party collaboration to govern the development and commercialization of certain anti-IgE antibodies, including *Xolair* and TNX-901. Under this agreement, all three parties co-developed *Xolair*. On August 2, 2007, Genentech, Inc. completed the acquisition of Tanox, Inc. and has taken over its rights and obligations. Novartis and Genentech/Roche are co-promoting *Xolair* in the United States, where Genentech/Roche records all sales. Novartis records sales outside the United States. Novartis markets *Xolair* and records all sales and related costs outside the United States as well as co-promotion costs in the US. Genentech/Roche and Novartis share the resulting profits from sales in the United States, Europe and other countries, according to agreed profit-sharing percentages. In 2018, Novartis recognized total sales of *Xolair* of USD 1 billion (2017: USD 920 million, 2016: USD 835 million), including sales to them for the United States market.

The net income for royalties, cost sharing and profit sharing arising out of the *Lucentis* and *Xolair* agreements with Genentech/Roche totaled USD 34 million in 2018 (net expense in 2017: USD 33 million, net expense in 2016: USD 217 million).

Furthermore, Novartis has several patent license, supply and distribution agreements with Roche.

Executive Officers and Non-Executive Directors compensation

During 2018, there were 17 Executive Committee members (“Executive Officers”), including those who stepped down during the year (11 members in 2017 and 14 members in 2016, also including those who stepped down).

The total compensation for members of the Executive Committee and the 13 Non-Executive Directors (13 in 2017 and 2016), using the Group’s accounting policies for equity-based compensation and pension benefits was as follows:

	Executive Officers			Non-Executive Directors			Total		
(USD millions)	2018	2017	2016	2018	2017	2016	2018	2017	2016
Cash and other compensation	22.5	18.4	20.8	4.0	4.0	4.0	26.5	22.4	24.8
Post-employment benefits	2.5	2.0	2.2				2.5	2.0	2.2
Equity-based compensation	42.5	49.9	46.2	4.8	4.8	4.6	47.3	54.7	50.8
Total	67.5	70.3	69.2	8.8	8.8	8.6	76.3	79.1	77.8

During 2018, there was a decrease in the IFRS compensation expense for Executive Officers mainly due to the higher pro-rata accelerated vesting of equity compensation in 2017, required by IFRS, in accordance with the plan rules. This was partially offset by the cash portion of buyout payments for new Executive Officers. The decrease in the IFRS compensation expense for Non-Executive Directors was due to one less Non-Executive Director following the 2018 Annual General Meeting.

During 2017, there was an increase in the IFRS compensation expense for Executive Officers, mainly due to the pro-rata accelerated vesting of equity-based compensation, required by IFRS, for an ECN member who stepped down on December 31, 2017, in accordance with the plan rules. This was partially offset by the reduction in the number of Executive Officers compared to 2016. The increase in the IFRS compensation expense for Non-Executive Directors was due to one additional Non-Executive Director appointed at the 2017 Annual General Meeting.

The Annual Incentive award, which is fully included in equity-based compensation even when paid out in cash, is granted in January in the year following the reporting period.

The disclosures on Board and executive compensation required by the Swiss Code of Obligations and in accordance with the Swiss Ordinance against Excessive

Compensation in Stock Exchange Listed Companies are shown in the compensation report of the Group.

Transactions with former members of the Board of Directors

During 2018, 2017 and 2016, the following payments (or waivers of claims) were made to former Board members or to "persons closely" linked to them:

	Currency	2018	2017	2016
Prof. Dr. Brody	CHF	0	0	25 000
Prof. Dr. Zinkernagel	CHF	0	0	50 000
Dr. Krauer	CHF	60 000	60 000	60 000
Dr. Vasella	CHF	18 228	26 279	0
	USD	0	0	250 000

Prof. Dr. William R. Brody and Prof. Dr. Rolf M. Zinkernagel, who stepped down from the Board of Directors at the 2014 AGM, received in 2016 and 2015 delegated Board membership fees for their work on the Boards of the Novartis Institute for Tropical Diseases (Prof. Dr. Zinkernagel) and the Genomics Institute of the Novartis Research Foundation (Prof. Dr. Brody and Prof. Dr. Zinkernagel). No payments were made in 2018 and 2017, as their respective mandates ended in 2016.

Dr. Alex Krauer, Honorary Chairman, is entitled to an amount of CHF 60 000 for annual periods from one AGM to the next. This amount was fixed in 1998 upon his departure from the Board in 1999, and has not been revised since that date.

Dr. Daniel Vasella, Honorary Chairman, was paid CHF 18 228 in 2018, and CHF 26 279 in 2017, for reimbursable costs under his agreement with the Company. In 2016, Dr. Daniel Vasella received the contractual minimum compensation under an agreement that became effective on November 1, 2013, and ended in 2016. Under this agreement, Dr. Vasella was compensated at a rate of USD 25 000 per day, with an annual guaranteed minimum fee of USD 250 000. This amount was in line with compensation practices at other large companies when retired chairmen or CEOs were retained in consulting agreements after leaving the board of directors.

Novartis Pension Fund

A Group subsidiary has provided an uncommitted overnight credit facility to the Novartis Pension Fund, Switzerland, for up to USD 500 million with interest at the US Federal Funds Rate. This credit facility was not utilized during the year and there are no outstanding balances.

27. Commitments and contingencies

Leasing commitments

The Group has entered into various fixed-term operational leases, mainly for cars and real estate. As of December 31, 2018, the Group's commitments with respect to these leases, including estimated payment dates, were as follows:

(USD millions)	2018
2019	372
2020	275
2021	225
2022	195
2023	182
Thereafter	2 363
Total	3 612
Expense of current year	383

Research and development commitments

The Group has entered into long-term research and development agreements with various institutions, which provide for potential milestone payments by Novartis that may be capitalized. As of December 31, 2018, the Group's commitments to make payments under those agreements, and their estimated timing, were as follows:

(USD millions)	2018
2019	228
2020	850
2021	782
2022	604
2023	1 059

Thereafter	894
Total	4 417

Other commitments

The Group has entered into various purchase commitments for services and materials as well as for equipment in the ordinary course of business. These commitments are generally entered into at current market prices and reflect normal business operations. For disclosure of Property, Plant end Equipment purchase commitments see Note 9.

Contingencies

Group companies have to observe the laws, government orders and regulations of the country in which they operate.

A number of Novartis companies are, and will likely continue to be, subject to various legal proceedings and investigations that arise from time to time, including proceedings regarding product liability; sales and marketing practices; commercial disputes; employment and wrongful discharge; and antitrust, securities, health and safety, environmental, tax, international trade, privacy and intellectual property matters. As a result, the Group may become subject to substantial liabilities that may not be covered by insurance and that could affect our business, financial position and reputation. While Novartis does not believe that any of these legal proceedings will have a material adverse effect on its financial position, litigation is inherently unpredictable and large judgments sometimes occur. As a consequence, Novartis may in the future incur judgments or enter into settlements of claims that could have a material adverse effect on its results of operations or cash flow.

Governments and regulatory authorities around the world have been stepping up their compliance and law enforcement activities in recent years in key areas, including marketing practices, pricing, corruption, trade restrictions, embargo legislation, insider trading, antitrust, cyber security and data privacy. Further, when one government or regulatory authority undertakes an investigation, it is not uncommon for other governments or regulators to undertake investigations regarding the same or similar matters. Responding to such investigations is costly and requires an increasing amount of management's time and attention. In addition, such investigations may affect our reputation, create a risk of potential exclusion from government reimbursement programs in the United States and other countries, and lead to (or arise from) litigation. These factors have contributed to decisions by Novartis and other companies in the healthcare industry, when deemed in their interest, to enter into settlement agreements with governmental authorities around the world prior to any formal decision by the authorities or a court. Those government settlements have involved and may continue to involve, in current government investigations and proceedings, large cash payments, sometimes in the hundreds of millions of dollars or more, including the potential repayment of amounts allegedly obtained improperly and other penalties, including treble damages. In addition, settlements of government healthcare fraud cases often require companies to enter into corporate integrity agreements, which are intended to regulate company behavior for a period of years. Our affiliate Novartis Pharmaceuticals Corporation is a party to such an agreement, which will expire in 2020. Also, matters underlying governmental investigations and settlements may be the subject of separate private litigation.

While provisions have been made for probable losses, which management deems to be reasonable or appropriate, there are uncertainties connected with these estimates.

Note 19 contains additional information on these matters.

A number of Group companies are involved in legal proceedings concerning intellectual property rights. The inherent unpredictability of such proceedings means that there can be no assurances as to their ultimate outcome. A negative result in any such proceeding could potentially adversely affect the ability of certain Novartis companies to sell their products, or require the payment of substantial damages or royalties.

In the opinion of management, however, the outcome of these actions will not materially affect the Group's financial position but could be material to the results of operations or cash flow in a given period.

The Group's potential environmental remediation liability is assessed based on a risk assessment and investigation of the various sites identified by the Group as at risk for environmental remediation exposure. The Group's future remediation expenses are affected by a number of uncertainties. These uncertainties include, but are not limited to, the method and extent of remediation, the percentage of material attributable to the Group at the remediation sites relative to that attributable to other parties, and the financial capabilities of the other potentially responsible parties.

Note 19 contains additional information on environmental liabilities.

28. Financial instruments – additional disclosures

(USD millions)	Note	2018 [1]	2017 [1]
Cash and cash equivalents	15	13 271	8 860
Financial assets - measured at fair value through other comprehensive income			
Marketable securities			
Debt securities	15	325	328
Fund investments	15		34
Total marketable securities - fair value through other comprehensive income		325	
Total marketable securities - available-for-sale marketable securities			362
Long-term financial investments			
Equity securities	12	802	1 073
Debt securities	12	31	36
Fund investments	12		166
Total long-term financial investments - fair value through other comprehensive income		833	
Total available-for-sale long-term financial investments			1 275
Total financial assets - measured at fair value through other comprehensive income		1 158	1 637
Financial assets - measured at amortized costs			
Trade receivables, income tax receivables, and other current assets (excluding contingent consideration receivables and pre-payments)	14/16	11 024	10 650
Accrued interest on debt securities and time deposits	15	12	1
Time deposits and short term investments with original maturity more than 90 days	15	2 087	125
Long-term loans and receivables from customers and finance lease, advances, security deposits	12	512	574
Total financial assets - measured at amortized costs		13 635	11 350
Financial assets - measured at fair value through the consolidated income statement			
Equity securities	12	353	
Fund investments	12/15	286	
Associated companies at fair value through profit and loss		145	216
Derivative financial instruments	15	130	31
Contingent consideration receivables	12/16	396	844
Total financial assets - measured at fair value through the consolidated income statement		1 310	1 091
Total financial assets		29 374	22 938
Financial liabilities - measured at amortized costs			
Current financial debt			
Interest-bearing accounts of associates payable on demand	20	1 778	1 822
Bank and other financial debt	20	701	692
Commercial paper	20	3 951	2 328
Current portion of non-current debt	20	3 190	359
Total current financial debt		9 620	5 201

Non-current financial debt			
Straight bonds	18	25 283	22 957
Liabilities to banks and other financial institutions	18	285	539
Finance lease obligations	18	92	87
Current portion of non-current debt	18	– 3 190	– 359
Total non-current financial debt		22 470	23 224
Trade payables and commitment for repurchase of own shares [2]		5 840	5 169
Total financial liabilities - measured at amortized costs		37 930	33 594
Financial liabilities - measured at fair value through the consolidated income statement			
Contingent consideration (see Note 19/21) and other financial liabilities		917	924
Derivative financial instruments	20	58	107
Total financial liabilities - measured at fair value through the consolidated income statement		975	1 031
Total financial liabilities		38 905	34 625

[1] Except for straight bonds (see Note 18), the carrying amount is a reasonable approximation of fair value.
[2] Note 17 and Note 21 provide additional disclosures related to commitment for repurchase of own shares.

Derivative financial instruments

The following tables show the contract or underlying principal amounts and fair values of derivative financial instruments analyzed by type of contract at December 31, 2018 and 2017. Contract or underlying principal amounts indicate the gross volume of business outstanding at the consolidated balance sheet date and do not represent amounts at risk. The fair values are determined by reference to market prices or standard pricing models that use observable market inputs at December 31, 2018 and 2017.

	Contract or underlying principal amount		Positive fair values		Negative fair values	
(USD millions)	2018	2017	2018	2017	2018	2017
Currency-related instruments						
Forward foreign exchange rate contracts	10 823	8 410	130	31	– 58	– 107
Total derivative financial instruments included in marketable securities and in current financial debts	10 823	8 410	130	31	– 58	– 107

The following table shows by currency contract or underlying principal amount the derivative financial instruments at December 31, 2018 and 2017:

	2018			
(USD millions)	EUR	USD	Other	Total
Currency-related instruments				
Forward foreign exchange rate contracts	2 989	6 558	1 276	10 823
Total derivative financial instruments	2 989	6 558	1 276	10 823

	2017			
(USD millions)	EUR	USD	Other	Total
Currency-related instruments				
Forward foreign exchange rate contracts	2 768	4 361	1 281	8 410
Total derivative financial instruments	2 768	4 361	1 281	8 410

Derivative financial instruments effective for hedge accounting purposes

At the end of 2018 and 2017, there were no open hedging instruments for anticipated transactions.

Fair value by hierarchy

As required by IFRS, financial assets and liabilities recorded at fair value in the consolidated financial statements are categorized based upon the level of judgment associated with the inputs used to measure their fair value. There are three hierarchical levels, based on an increasing amount of subjectivity associated with the inputs to derive fair valuation for these assets and liabilities, which are as follows:

The assets carried at Level 1 fair value are equity and debt securities listed in active markets.

The assets generally included in Level 2 fair value hierarchy are foreign exchange and interest rate derivatives and certain debt securities. Foreign exchange and interest rate derivatives are valued using corroborated market data. The liabilities generally included in this fair value hierarchy consist of foreign exchange and interest rate derivatives.

Level 3 inputs are unobservable for the asset or liability. The assets generally included in Level 3 fair value hierarchy are various investments in hedge funds and unquoted equity security investments. Contingent consideration carried at fair value is included in this category.

	2018				
(USD millions)	Level 1	Level 2	Level 3	Valued at amortized cost	Total
Financial assets					
Debt securities	302	23			325
Fund investments	35				35
Total marketable securities	337	23			360
Time deposits and short term investments with original maturity more than 90 days				2 087	2 087
Derivative financial instruments		130			130
Accrued interest on debt securities, time deposits and short term investments				12	12
Total marketable securities, time deposits and derivative financial instruments	337	153		2 099	2 589
Long term financial investments	698		488		1 186
Fund investments			251		251
Contingent consideration receivables			396		396
Long-term loans and receivables from customers and finance lease, advances, security deposits				512	512
Financial investments and long-term loans	698		1 135	512	2 345
Associated companies at fair value through profit and loss			145		145
Contingent consideration receivables short-term					0
Financial liabilities					
Contingent consideration payables			– 907		– 907
Other financial liabilities			– 10		– 10
Derivative financial instruments		– 58			– 58
Total financial liabilities at fair value		– 58	– 917		– 975

	2017				
(USD millions)	Level 1	Level 2	Level 3	Valued at amortized cost	Total
Financial assets					
Debt securities	303	25			328
Fund investments	34				34
Total available-for-sale marketable securities	337	25			362
Time deposits with original maturity more than 90 days				125	125
Derivative financial instruments		31			31
Accrued interest on debt securities				1	1
Total marketable securities, time deposits and derivative financial instruments	337	56		126	519
Available-for-sale financial investments	672		437		1 109
Fund investments			166		166
Contingent consideration receivables			394		394
Long-term loans and receivables from customers and finance lease, advances, security deposits				574	574
Financial investments and long-term loans	672		997	574	2 243
Associated companies at fair value through profit and loss	28		188		216
Contingent consideration receivables short-term			450		450

Financial liabilities			
Contingent consideration payables		– 852	– 852
Other financial liabilities		– 72	– 72
Derivative financial instruments	– 107		– 107
Total financial liabilities at fair value	– 107	– 924	– 1 031

The analysis above includes all financial instruments, including those measured at amortized cost.

The change in carrying values associated with Level 3 financial instruments using significant unobservable inputs during the year ended December 31 is set forth below:

	2018					
(USD millions)	Associated companies at fair value through profit and loss	Fund investments	Long term financial investments	Contingent consideration receivables	Contingent consideration payables	Other financial liabilities
January 1	188	166	437	844	– 852	– 72
Fair value gains and other adjustments, including from divestments recognized in the consolidated income statement		93		36	213	
Fair value losses (including impairments and amortizations) and other adjustments recognized in the consolidated income statement	– 22		– 5		– 100	
Fair value adjustments recognized in the consolidated statement of comprehensive income			– 10			
Purchases	24	22	123		– 182	
Cash receipts and payments				– 484	11	62
Disposals	– 6	– 30	– 25			
Contingent consideration payable related to disposal group held for sale					3	
Reclassification	– 39		– 32			
December 31	145	251	488	396	– 907	– 10
Total of fair value gains and losses recognized in the consolidated income statement for assets and liabilities held at December 31, 2018	– 22	93	– 5	36	113	0

	2017					
(USD millions)	Associated companies at fair value through profit and loss	Fund investments	Available-for-sale financial investments	Contingent consideration receivables	Contingent consideration payables	Other financial liabilities
January 1	188	107	476	586	– 889	– 129
Fair value gains and other adjustments, including from divestments recognized in the consolidated income statement	45		32	278	362	

Fair value losses (including impairments and amortizations) and other adjustments recognized in the consolidated income statement	– 34		– 45		– 193	– 37
Fair value adjustments recognized in the consolidated statement of comprehensive income		45	– 40			
Purchases	37	28	113		– 238	
Cash receipts and payments				– 20	106	94
Disposals	– 19	– 18	– 52			
Reclassification	– 29	4	– 47			
December 31	188	166	437	844	– 852	– 72
Total of fair value gains and losses recognized in the consolidated income statement for assets and liabilities held at December 31, 2017	11	0	– 13	278	169	– 37

During 2018, there were several individually non-significant transfers of financial investments from Level 3 to Level 1 for USD 78 million (2017: USD 73 million), mainly due to initial public offerings of the invested companies.

Realized gains and losses associated with Level 3 marketable securities are recorded in the consolidated income statement under “Other financial income and expense,” and realized gains and losses associated with Level 3 long-term financial investments measured at fair value through the consolidated income statement are recorded in the consolidated income statement under “Other income” or “Other expense,” respectively. Realized gains and losses associated with Level 3 long-term financial investments measured at fair value through other comprehensive income are not recycled through the consolidated income statement but reclassified to retained earnings instead.

During the year, the net loss and net gain recorded on equity securities and fund investments at fair value through the consolidated income statement is USD 56 million and USD 93 million, respectively.

If the pricing parameters for the Level 3 input were to change for associated companies at fair value through profit and loss, fund investments and financial invest-

ments by 10% positively or negatively, this would change the amounts recorded in the 2018 consolidated statement of comprehensive income by USD 88 million.

For the determination of the fair value of a contingent consideration, various unobservable inputs are used. A change in these inputs might result in a significantly higher or lower fair value measurement. The inputs used are, among others, the probability of success, sales forecast and assumptions regarding the discount rate, timing and different scenarios of triggering events. The inputs are interrelated. The significance and usage of these inputs to each contingent consideration may vary due to differences in the timing and triggering events for payments or in the nature of the asset related to the contingent consideration.

If the most significant parameters for the Level 3 input were to change by 10% positively or negatively, or where the probability of success (POS) is the most significant input parameter, 10% were added or deducted from the applied probability of success, for contingent consideration payables, other financial liabilities and contingent consideration receivables, this would change the amounts recorded in the 2018 consolidated income statement by USD 341 million and USD 330 million, respectively.

Equity securities measured at fair value through other comprehensive income

Equity securities held as strategic investments, typically held outside the Novartis Venture Fund, are generally designated at date of acquisition as financial assets valued at fair value through other comprehensive income with no subsequent recycling through profit and loss. These are made up of individually non-significant investments. At December 31, 2018, the Group holds 41 non-listed equity securities and 26 listed equity securities in this category with the following fair values:

(USD millions)	2018 [1]
Listed equity securities	597
Non-listed equity securities	205
Total equity securities	802

[1] These investments were classified as available-for-sale in 2017, prior to the adoption of IFRS 9 Financial Instruments, see Note 1.

There were no dividends recognized during 2018 from these equity securities. In 2018, equity securities that were no longer considered strategic, with a fair value of USD 21 million, were sold, and the USD 16 million gain was transferred from other comprehensive income to retained earnings during 2018 (see Note 8.)

Nature and extent of risks arising from financial instruments

Market risk

Novartis is exposed to market risk, primarily related to foreign currency exchange rates, interest rates, and the market value of the investments of liquid funds. The Group actively monitors and seeks to reduce, where it deems it appropriate to do so, fluctuations in these exposures. It is the Group’s policy and practice to enter into a variety of derivative financial instruments to manage the volatility of these exposures and to enhance the yield on the investment of liquid funds. It does not enter into any financial transactions containing a risk that cannot be quantified at the time the transaction is concluded. In addition, it does not sell short assets it does not have, or does not know it will have, in the future. The Group only sells existing assets or enters into transactions and future transactions (in the case of anticipatory hedges) that it confidently expects it will have in the future, based on past experience. In the case of liquid funds, the Group writes call options on assets it has, or writes put options on positions it wants to acquire and has the liquidity to acquire. The Group expects that any loss in value for these instruments generally would be offset by increases in the value of the underlying transactions.

Foreign currency exchange rate risk

The Group uses the US dollar as its reporting currency. As a result, the Group is exposed to foreign currency exchange movements, primarily in European, Japanese and emerging market currencies. Fluctuations in the exchange rates between the US dollar and other currencies can have a significant effect on both the Group’s results of operations, including reported sales and earnings, as well as on the reported value of our assets, liabilities and cash flows. This, in turn, may significantly affect the comparability of period-to-period results of operations.

Because our expenditures in Swiss francs are significantly higher than our revenues in Swiss francs, volatility in the value of the Swiss franc can have a significant impact on the reported value of our earnings, assets and liabilities, and the timing and extent of such volatility can be difficult to predict. In addition, there is a risk that certain countries

could take other steps that could significantly impact the value of their currencies.

The Group is exposed to a potential adverse devaluation risk on its intercompany funding and total investment in certain subsidiaries operating in countries with exchange controls. The most significant foreign exchange losses (USD 0.3 billion) occurred in Venezuela in 2016. The net outstanding intercompany payable balance of Venezuela subsidiaries was not significant at December 31, 2018, and at December 31, 2017, due to reserves against the intercompany balances.

The Group manages its global currency exposure by engaging in hedging transactions where management deems appropriate. Novartis may enter into various contracts that reflect the changes in the value of foreign currency exchange rates to preserve the value of assets, commitments and anticipated transactions. Novartis also uses forward contracts and foreign currency option contracts to hedge.

Net investments in subsidiaries in foreign countries are long-term investments. Their fair value changes through movements of foreign currency exchange rates. The Group has designated a certain portion of its long-term euro-denominated straight bonds as hedges of the translation risk arising on certain of these net investments in foreign operations with euro functional cur-

rency. As of December 31, 2018, long-term financial debt with a carrying amount of EUR 1.8 billion (USD 2.1 billion) (2017: USD 2.2 billion) has been designated as a hedge instrument. During 2018, USD 95 million (unrealized loss in 2017: USD 237 million) of unrealized income was recognized in other comprehensive income and accumulated in currency translation effects in relation with this net investment hedge. The hedge remained effective since inception, and no amount was recognized in the consolidated income statement in 2018 and 2017. During 2016, the Group did not apply net investment hedge accounting.

Commodity price risk

The Group has only a very limited exposure to price risk related to anticipated purchases of certain commodities used as raw materials by the Group's businesses. A change in those prices may alter the gross margin of a specific business, but generally by not more than 10% of the margin and thus below the Group's risk management tolerance levels. Accordingly, the Group does not enter into significant commodity futures, forward and option contracts to manage fluctuations in prices of anticipated purchases.

Interest rate risk

The Group addresses its net exposure to interest rate risk mainly through the ratio of its fixed-rate financial debt to variable-rate financial debt contained in its total financial debt portfolio. To manage this mix, Novartis may enter into interest rate swap agreements, in which it exchanges periodic payments based on a notional amount and agreed-upon fixed and variable interest rates.

Equity risk

The Group may purchase equities as investments of its liquid funds. As a policy, it limits its holdings in an unrelated company to less than 5% of its liquid funds. Potential investments are thoroughly analyzed. Call options are written on equities that the Group owns, and put options are written on equities that the Group wants to buy and for which cash is available.

Credit risk

Credit risks arise from the possibility that customers may not be able to settle their obligations as agreed. To manage this risk, the Group periodically assesses country and customer credit risk, assigns individual credit limits, and takes actions to mitigate credit risk where appropriate.

The provisions for expected credit losses for customers are based on a forward-looking expected credit loss, which includes possible default events on the trade receivables over the entire holding period of the trade receivable.

In measuring the expected credit losses, trade receivables are grouped based on shared credit risk characteristics (such as private versus public receivables) and days past due. In determining the expected credit loss rates, the Group considers current and forward-looking macroeconomic factors that may affect the ability of the customers to settle the receivables, and historical loss rates for each category of customers.

The Group's largest customer accounted for approximately 16% of net sales, and the second largest and third largest customers accounted for 13% and 7% of net sales, respectively (2017: 17%, 12% and 7%, respectively; 2016: 16%, 12% and 6%, respectively). No other customer accounted for 5% or more of net sales in either year.

The highest amounts of trade receivables outstanding were for these same three customers and amounted to 12%, 10% and 6%, respectively, of the Group's trade receivables at December 31, 2018 (2017: 14%, 9% and 5%, respectively). There is no other significant concentration of customer credit risk.

Counterparty risk

Counterparty risk encompasses issuer risk on marketable securities and money market instruments, credit risk on cash, time deposits and derivatives, as well as settlement risk for different instruments. Issuer risk is reduced by only buying securities that are at least A- rated. Counterparty credit risk and settlement risk are reduced by a policy of entering into transactions with counterparties (banks or financial institutions) that feature a strong credit rating. Exposure to these risks is closely monitored and kept within predetermined parameters. The limits are regularly assessed and determined based upon credit analysis, including financial statement and capital adequacy ratio reviews. In addition, reverse repurchasing agreements are contracted, and Novartis has entered into credit support agreements with various banks for derivative transactions.

The Group's cash and cash equivalents are held with major regulated financial institutions; the three largest ones hold approximately 9.4%, 7.6% and 7.0%, respectively (2017: 20.2%, 15.0% and 12.7%, respectively).

The Group does not expect any losses from non-performance by these counterparties and does not have any significant grouping of exposures to financial sector or country risk.

Liquidity risk

Liquidity risk is defined as the risk that the Group could not be able to settle or meet its obligations on time or at a reasonable price. Group Treasury is responsible for liquidity, funding and settlement management. In addition, liquidity and funding risks, and related processes and policies, are overseen by management. Novartis manages its liquidity risk on a consolidated basis according to business needs and tax, capital or regulatory considerations, if applicable, through numerous sources of financing in order to maintain flexibility. Management monitors the Group's net debt or liquidity position through rolling forecasts on the basis of expected cash flows.

Novartis has two US commercial paper programs under which it can issue up to USD 9.0 billion in the aggregate of unsecured commercial paper notes. Novartis also has a Japanese commercial paper program under which it can issue up to JPY 150 billion (approximately USD 1.4 billion) of unsecured commercial paper notes. Commercial paper notes totaling USD 4.0 billion under these three programs were outstanding as per December 31, 2018 (2017: USD 2.3 billion). Novartis further has a committed credit facility of USD 6.0 billion, entered into on September 23, 2015. This credit facility is provided by a syndicate of banks and is intended to be

used as a backstop for the US commercial paper programs. It matures in September 2020 and was undrawn as per December 31, 2018, and December 31, 2017.

The following table sets forth how management monitors net debt or liquidity based on details of the remaining contractual maturities of current financial assets and liabilities, excluding trade receivables and payables as well as contingent considerations at December 31, 2018, and December 31, 2017:

	2018					
(USD millions)	Due within one month	Due later than one month but less than three months	Due later than three months but less than one year	Due later than one year but less than five years	Due after five years	Total
Current assets						
Marketable securities, time deposits and short-term investments with original maturity more than 90 days	39	56	2 091	198	63	2 447
Commodities					104	104
Derivative financial instruments and accrued interest	40	75	27			142
Cash and cash equivalents	3 571	9 700				13 271
Total current financial assets	3 650	9 831	2 118	198	167	15 964
Non-current liabilities						
Financial debt				– 8 980	– 13 490	– 22 470
Financial debt - undiscounted				– 9 025	– 13 623	– 22 648
Total non-current financial debt				– 8 980	– 13 490	– 22 470
Current liabilities						
Financial debt	– 5 217	– 4 084	– 319			– 9 620
Financial debt - undiscounted	– 5 217	– 4 084	– 319			– 9 620
Derivative financial instruments	– 16	– 34	– 8			– 58
Total current financial debt	– 5 233	– 4 118	– 327			– 9 678
Net debt	– 1 583	5 713	1 791	– 8 782	– 13 323	– 16 184

	2017					
(USD millions)	Due within one month	Due later than one month but less than three months	Due later than three months but less than one year	Due later than one year but less than five years	Due after five years	Total
Current assets						
Marketable securities and time deposits	71	72	105	181	58	487
Commodities					106	106
Derivative financial instruments and accrued interest	7	19	6			32
Cash and cash equivalents	4 260	4 600				8 860

Total current financial assets	4 338	4 691	111	181	164	9 485
Non-current liabilities						
Financial debt				– 9 849	– 13 375	– 23 224
Financial debt - undiscounted				– 9 893	– 13 519	– 23 412
Total non-current financial debt				– 9 849	– 13 375	– 23 224
Current liabilities						
Financial debt	– 4 576	– 169	– 456			– 5 201
Financial debt - undiscounted	– 4 576	– 169	– 456			– 5 201
Derivative financial instruments	– 31	– 48	– 28			– 107
Total current financial debt	– 4 607	– 217	– 484			– 5 308
Net debt	– 269	4 474	– 373	– 9 668	– 13 211	– 19 047

The consolidated balance sheet amounts of financial liabilities included in the above analysis are not materially different to the contractual amounts due on maturity. The positive and negative fair values on derivative financial instruments represent the net contractual amounts to be exchanged at maturity.

The Group's contractual undiscounted potential cash flows from derivative financial instruments to be settled on a gross basis are as follows:

	2018			
(USD millions)	Due within one month	Due later than one month but less than three months	Due later than three months but less than one year	Total
Derivative financial instruments and accrued interest on derivative financial instruments				
Potential outflows in various currencies - from financial derivative liabilities	– 1 305	– 2 949	– 598	– 4 852
Potential inflows in various currencies - from financial derivative assets	1 328	2 974	593	4 895

	2017			
(USD millions)	Due within one month	Due later than one month but less than three months	Due later than three months but less than one year	Total
Derivative financial instruments and accrued interest on derivative financial instruments				
Potential outflows in various currencies - from financial derivative liabilities	– 953	– 972	– 2 824	– 4 749
Potential inflows in various currencies - from financial derivative assets	928	948	2 778	4 654

Other contractual liabilities that are not part of management's monitoring of the net debt or liquidity consist of the following items:

	2018				
(USD millions)	Due later than one month but less than three months	Due later than three months but less than one year	Due later than one year but less than five years	Due after five years	Total
Contractual interest on non-current liabilities	– 113	– 459	– 1 667	– 3 755	– 5 994
Trade payables	– 5 556				– 5 556

	2017		
(USD millions)	Due later than	Due later than	Due later than

	one month but less than three months	three months but less than one year	one year but less than five years	Due after five years	Total
Contractual interest on non-current liabilities	– 113	– 507	– 1 765	– 3 859	– 6 244
Trade payables	– 5 169				– 5 169

Capital risk management

Novartis strives to maintain a strong credit rating. In managing its capital, Novartis focuses on maintaining a strong balance sheet. As of December 31, 2018, Moody’s Investor Service rated the Company A1 for long-term maturities and P-1 for short-term maturities and S&P Global Ratings had a rating of AA- for long-term maturities and A-1+ for short-term maturities.

The debt/equity ratio increased to 0.41:1 at December 31, 2018, compared to 0.38:1 at the beginning of the year.

Value at risk

The Group uses a value at risk (VAR) computation to estimate the potential 10-day loss in the fair value of its financial instruments.

A 10-day period is used because of an assumption that not all positions could be undone in one day given the size of the positions. The VAR computation includes all financial assets and financial liabilities as set forth in the table on page F-68, except trade receivables, income tax receivables and other current assets, contingent considerations, finance lease obligations, long-term loans and receivables from customers and finance lease, advances and security deposits and trade payables.

The VAR estimates are made assuming normal market conditions, using a 95% confidence interval. The Group uses a "Delta Normal" model to determine the observed interrelationships between movements in interest rates, stock markets and various currencies. These inter-relationships are determined by observing interest rate, stock market movements and forward foreign currency rate movements over a 60-day period for the calculation of VAR amounts.

The estimated potential 10-day loss in the fair value of the Group's foreign currency positions (including foreign exchange translation risk), the estimated potential 10-day loss of its equity holdings, and the estimated potential 10-day loss in fair value of its interest rate-sensitive instruments (primarily financial debt and investments of liquid funds under normal market conditions) as calculated in the VAR model are the following:

(USD millions)	2018	2017
All financial instruments	337	498
Analyzed by components:		
Instruments sensitive to foreign currency exchange rates	217	184
Instruments sensitive to equity market movements	122	27
Instruments sensitive to interest rates	221	242

The average, high and low VAR amounts are as follows:

	2018		
(USD millions)	Average	High	Low
All financial instruments	443	553	337
Analyzed by components:			
Instruments sensitive to foreign currency exchange rates	324	473	217
Instruments sensitive to equity market movements	60	122	22
Instruments sensitive to interest rates	253	361	169

	2017		
(USD millions)	Average	High	Low
All financial instruments	521	560	466
Analyzed by components:			
Instruments sensitive to foreign currency exchange rates	277	352	184
Instruments sensitive to equity market movements	28	35	21
Instruments sensitive to interest rates	282	338	219

The VAR computation is a risk analysis tool designed to statistically estimate the potential 10-day loss from adverse movements in foreign currency exchange rates, equity prices and interest rates under normal market conditions. The computation does not purport to represent actual losses in fair value on earnings to be incurred by the Group, nor does it consider the effect of favorable changes in market rates. The Group cannot predict actual future movements in such market rates, and it does not claim that these VAR results are indicative of future movements in such market rates or are representative of any actual impact that future changes in market rates may have on the Group's future results of operations or financial position.

In addition to these VAR analyses, the Group uses stress-testing techniques that aim to reflect a worst-case scenario on the marketable securities that are monitored by Group Treasury. For these calculations, the Group uses the six-month period with the worst performance observed over the past 20 years in each category. For 2018 and 2017, the worst case loss scenario was calculated as follows:

(USD millions)	2018	2017
All financial instruments	7	7
Analyzed by components:		
Instruments sensitive to foreign currency exchange rates		
Instruments sensitive to equity market movements		
Instruments sensitive to interest rates	7	7

In the Group's risk analysis, Novartis considered this worst-case scenario acceptable, as it could reduce income but would not endanger the solvency or investment grade credit rating of the Group.

29. Impacts of adoption of new IFRS standards

Note 1 explains the changes and new accounting policies introduced on January 1, 2018, resulting from the adoption of the new accounting standards IFRS 9 Financial Instruments and IFRS 15 Revenue from Contracts with Customers.

The most significant impact from the adoption of IFRS 15 Revenue from Contracts with Customers relates to the timing of the recognition of income from upfront and milestone payments received under co-marketing and co-promotion agreements. Under IFRS 15, as these agreements are accounted for as a right to use license of intellectual property (IP), and the performance obligation to transfer the licenses to the counterparty to the agreement (the licensee) has been satisfied, revenue is recognized at the point in time when the upfront payment is received and when the milestone criteria is highly probable to be met. Under IAS 18, upfront and milestone payments received under co-marketing and co-promotion agreements were deferred and amortized to other revenue over the term of the agreements. Therefore, upon adoption of IFRS 15, the deferred revenue and related deferred taxes, in relation to the upfront payments and milestone payments received, have been derecognized and the impact to retained earnings has been accordingly recognized in the amount of USD 60 million.

The following table shows the changes to the line items of the January 1, 2018, consolidated balance sheet by the adoption of IFRS 15:

(USD millions)	January 1, 2018	Adjustment IFRS 15	Adjusted January 1, 2018
Assets			
Non-current assets			
Deferred tax assets	8 229	– 4	8 225
Total non-current assets	104 871	– 4	104 867
Total assets	133 079	– 4	133 075
Equity and liabilities			
Equity			
Reserves	73 299	60	73 359
Total equity	74 227	60	74 287
Non-current liabilities			
Deferred tax liabilities	5 168	12	5 180
Provision and other non-current liabilities	7 057	– 69	6 988
Total non-current liabilities	35 449	– 57	35 392
Current liabilities			
Provision and other current liabilities	11 203	– 7	11 196
Total current liabilities	23 403	– 7	23 396
Total equity and liabilities	133 079	– 4	133 075

The amount by which the line items in the December 31, 2018, consolidated income statement and consolidated statement of cash flow were affected by the application of IFRS 15 Revenue from Contracts with Customers, as compared to IAS 18 Revenues and related interpretations, was not significant.

The adoption of IFRS 9 Financial Instruments had no impact to the line items of the January 1, 2018, consolidated balance sheet.

The transition impact of IFRS 9 Financial Instruments was from the previously recognized unrealized gains accumulated in “Other comprehensive income” (OCI) in equity related to fund investments (USD 75 million) and on equity securities held by the Novartis Venture Fund (USD 102 million). The total amount of USD 177 million was transferred from OCI reserves into retained earnings on January 1, 2018. With the adoption of IFRS 9, from January 1, 2018, these investments are measured at fair value through profit and loss (formerly under IAS 39 measured at fair value through OCI (FVOCI), with impairments recognized in profit and loss and gains recycled out of OCI to profit and loss at the date the financial instrument was divested).

There was no transition impact on financial instruments held for long-term purposes, recorded as long-term financial assets on the consolidated balance sheet, where the irrevocable FVOCI option was applied, as they continue to be measured at fair value through OCI. In subsequent periods, upon a divestment of these investments, the OCI reserves amount will be transferred directly to retained earnings. Prior to the adoption of IFRS 9, unrealized gains recognized in OCI reserves were recycled to profit and loss.

There is no significant impact from the new expected credit loss (ECL) impairment model under IFRS 9 to the Group's allowances and provisions for trade receivable, finance lease receivables and other short- and long-term receivables.

The following table shows the changes to the line items of the January 1, 2018, consolidated statement of changes in equity by the adoption of IFRS 9 and IFRS 15:

(USD millions)	January 1, 2018	Adjustment IFRS 9	Adjustment IFRS 15	Adjusted January 1, 2018
Retained earnings	77 639	177	60	77 876
Total fair value adjustments	– 4 340	– 177		– 4 517
Total equity	74 227		60	74 287

The following condensed table shows the changes to the line items of the January 1, 2018, financial instruments additional disclosures table by the adoption of IFRS 9:

(USD millions)	Carrying value January 1, 2018	Reclassi-fications	Adjusted carrying value January 1, 2018	Retained earnings effect January 1, 2018	OCI reserves effect January 1, 2018
Cash and cash equivalents	8 860		8 860		
Financial assets - measured at fair value through other comprehensive income					
Marketable securities					
Debt securities	328		328		
Fund investments	34	– 34			
Total marketable securities	362	– 34	328		
Long-term financial investments					
Equity securities	1 073	– 386	687	102	– 102
Debt securities	36		36		
Fund investments	166	– 166		75	– 75
Total long-term financial investments	1 275	– 552	723	177	– 177
Total financial assets - measured at fair value through other comprehensive income	1 637	– 586	1 051	177	– 177
Financial assets - measured at amortized costs	11 350		11 350		
Financial assets - measured at fair value through the consolidated income statement	1 091	586	1 677		
Total financial assets	22 938		22 938	177	– 177
Financial liabilities - measured at amortized costs	33 594		33 594		
Financial liabilities - measured at fair value through the consolidated income statement	1 031		1 031		
Total financial liabilities	34 625		34 625		

30. Events subsequent to the December 31, 2018, consolidated balance sheet date

Dividend proposal for 2018 and approval of the Group's 2018 consolidated financial statements

On January 29, 2019, the Novartis AG Board of Directors proposed the acceptance of the 2018 consolidated financial statements of the Novartis Group for approval by the Annual General Meeting on February 28, 2019. Furthermore, also on January 29, 2019, the Board proposed a dividend of CHF 2.85 per share to be approved at the Annual General Meeting on February 28, 2019. If approved, total dividend payments would amount to approximately USD 6.7 billion (2017: USD 7.0billion), using the CHF/USD December 31, 2018, exchange rate.

Corporate – proposal to the Annual General Meeting of Shareholders to approve a spin-off transaction of the Alcon Division

On June 29, 2018, Novartis announced its intention to seek shareholder approval for the spin-off of the Alcon business into a separately traded standalone company, following the complete and structural separation of the Alcon business into a standalone company. If the spin-off is approved at the 2019 AGM and the conditions precedent for the distribution are met, Novartis will effect the spin-off and distribute to its shareholders and ADR holders, by way of a dividend in kind, 1 Alcon share for every 5 dividend bearing share of Novartis AG (the Distribution). No dividend in kind will be declared on treasury shares held by Novartis AG or its fully owned subsidiaries.

Completion of the Distribution is subject to shareholder approval at the 2019 AGM in line with Swiss corporate law and the following conditions precedent:

(i) The Alcon Shares shall have been admitted to listing on the SIX Swiss Exchange and the New York Stock Exchange as from the ex-dividend date (subject to technical deliverables only);

(ii) The U.S. Securities and Exchange Commission ("SEC") shall have declared effective the registration statement on Form 20-F for the Alcon Shares under the U.S. Securities Exchange Act of 1934, as amended, and no stop order suspending the effectiveness of this registration statement shall be in effect and no proceedings for that purpose shall be pending before or threatened by the SEC;

(iii) No order, injunction or decree issued by any governmental authority of competent jurisdiction or other legal restraint or prohibition preventing consummation of the spin-off of Alcon shall be in effect, and no other event outside the control of Novartis shall have occurred or failed to occur that prevents the consummation of the spin-off of Alcon (including, but not limited to, Novartis not being able to complete the internal transactions to separate the businesses currently constituting the eye care devices business of Novartis, comprising its Surgical and Vision Care operations, from the other businesses, due to elements outside of its reasonable control); and

(iv) No other events or developments shall have occurred prior to the ex-dividend date of the Distribution that, in the judgment of the Novartis Board of Directors, would result in the spin-off of Alcon having a material adverse effect (including, but not limited to, material adverse tax consequences or risks) on Novartis or its shareholders.

The Board of Directors shall (i) determine whether these conditions precedent are satisfied and, to the extent legally permissible, have authority to waive any conditions precedent if such waiver is, in the judgment of the Board of Directors, in the best interest of Novartis and its shareholders; and (ii) set the record, ex-dividend and settlement dates of the Distribution, which shall occur as soon as practicable following the satisfaction (or waiver) of these conditions precedent.

The Group expects the fair value of the distribution liability of the Alcon business, which will be recognized upon shareholders' approval, to be in excess of the carrying value of the net assets of the Alcon business at the date of the Distribution to the Novartis AG shareholders, assuming no significant changes in market conditions or Alcon's business performance outlook.

31. Principal Group subsidiaries and associated companies

The following table lists the principal subsidiaries controlled by Novartis, associated companies in which Novartis is deemed to have significant influence and foundations required to be consolidated under IFRS. It includes all subsidiaries, associated companies and consolidated foundations with total assets or net sales to third parties in excess of USD 25 million. The equity interest percentage shown in the table also represents the share in voting rights in those entities, except where explicitly noted.

As at December 31, 2018			Share capital [1]	Equity interest
Algeria				
Société par actions SANDOZ	Algiers	DZD	650.0m	100%
Argentina				
Novartis Argentina S.A.	Buenos Aires	ARS	906.1m	100%
Australia				
Novartis Australia Pty Ltd	Macquarie Park, NSW	AUD	2	100%
Novartis Pharmaceuticals Australia Pty Ltd	Macquarie Park, NSW	AUD	3.8m	100%
Sandoz Pty Ltd	Macquarie Park, NSW	AUD	11.6m	100%
Alcon Laboratories (Australia) Pty Ltd	Macquarie Park, NSW	AUD	2.6m	100%
Austria				
Novartis Austria GmbH	Vienna	EUR	1.0m	100%
Novartis Pharma GmbH	Vienna	EUR	1.1m	100%
Sandoz GmbH	Kundl	EUR	32.7m	100%
EBEWE Pharma Ges.m.b.H Nfg. KG	Unterach am Attersee	EUR	1.0m	100%
Bangladesh				
Novartis (Bangladesh) Limited	Gazipur	BDT	162.5m	60%
Belgium				
Novartis Pharma NV	Vilvoorde	EUR	7.1m	100%
Sandoz NV	Vilvoorde	EUR	19.2m	100%
Alcon - Couvreur NV	Puurs	EUR	110.6m	100%
Alcon Laboratories Belgium BVBA	Puurs	EUR	18 550	100%
Alcon NV	Vilvoorde	EUR	141 856	100%
Bermuda				
Novartis Investment Ltd.	Hamilton [3]	USD	12 000	100%
Novartis Securities Investment Ltd.	Hamilton	CHF	30 000	100%
Novartis Finance Services Ltd.	Hamilton	CHF	20 000	100%
Triangle International Reinsurance Limited	Hamilton	CHF	1.0m	100%
Trinity River Insurance Co Ltd.	Hamilton	USD	370 000	100%
Brazil				
Novartis Biociências S.A.	São Paulo	BRL	265.0m	100%
Sandoz do Brasil Indústria Farmacêutica Ltda.	Cambé, PR	BRL	190.0m	100%
Canada				
Novartis Pharmaceuticals Canada Inc.	Dorval, Quebec	CAD	1.2m	100%
Sandoz Canada Inc.	Boucherville, Quebec	CAD	80.8m	100%
Alcon Canada Inc.	Mississauga, Ontario	CAD	2 500	100%

CIBA Vision Canada Inc.	Mississauga, Ontario	CAD	82 886	100%
Chile				
Novartis Chile S.A.	Santiago de Chile	CLP	2.0bn	100%
Alcon Laboratorios Chile Ltd.	Santiago de Chile	CLP	2.0bn	100%
China				
Beijing Novartis Pharma Co., Ltd.	Beijing	USD	30.0m	100%
Novartis Pharmaceuticals (HK) Limited	Hong Kong	HKD	200	100%
China Novartis Institutes for BioMedical Research Co., Ltd.	Shanghai	USD	320.0m	100%
Suzhou Novartis Pharma Technology Co., Ltd.	Changshu	USD	109.4m	100%
Shanghai Novartis Trading Ltd.	Shanghai	USD	3.2m	100%
Sandoz (China) Pharmaceutical Co., Ltd.	Zhongshan	USD	57.6m	100%
Alcon Hong Kong, Limited	Hong Kong	HKD	77 000	100%
Alcon (China) Ophthalmic Product Co., Ltd.	Beijing	USD	60.0m	100%
Colombia				
Novartis de Colombia S.A.	Santafé de Bogotá	COP	7.9bn	100%
Laboratorios Alcon de Colombia S.A.	Santafé de Bogotá	COP	20.9m	100%
Croatia				
Sandoz d.o.o. farmaceutska industrija	Zagreb	HRK	25.6m	100%
Czech Republic				
Novartis s.r.o.	Prague	CZK	51.5m	100%
Sandoz s.r.o.	Prague	CZK	44.7m	100%
Alcon Pharmaceuticals (Czech Republic) s.r.o.	Prague	CZK	31.0m	100%
Denmark				
Novartis Healthcare A/S	Copenhagen	DKK	14.0m	100%
Sandoz A/S	Copenhagen	DKK	12.0m	100%
Alcon Nordic A/S	Copenhagen	DKK	501 000	100%
Ecuador				
Novartis Ecuador S.A.	Quito	USD	4.0m	100%
Egypt				
Novartis Pharma S.A.E.	Cairo	EGP	193.8m	99.77%
Sandoz Egypt Pharma S.A.E.	New Cairo City	EGP	250 000	100%
Finland				
Novartis Finland Oy	Espoo	EUR	459 000	100%
As at December 31, 2018			Share capital [1]	Equity interest
France				
Novartis Groupe France S.A.	Rueil-Malmaison	EUR	903.0m	100%
Novartis Pharma S.A.S.	Rueil-Malmaison	EUR	43.4m	100%
Advanced Accelerator Applications S.A.	Saint-Genis-Pouilly	EUR	9.6m	99.07%
Sandoz S.A.S.	Levallois-Perret	EUR	5.4m	100%
Laboratoires Alcon S.A.S.	Rueil-Malmaison	EUR	12.9m	100%
Germany				
Novartis Deutschland GmbH	Nuremberg	EUR	155.5m	100%
Novartis Business Services GmbH	Wehr	EUR	25 000	100%

Novartis Pharma GmbH	Nuremberg	EUR	25.6m	100%
Novartis Pharma Produktions GmbH	Wehr	EUR	2.0m	100%
Sandoz International GmbH	Holzkirchen	EUR	100 000	100%
1 A Pharma GmbH	Oberhaching	EUR	26 000	100%
HEXAL AG	Holzkirchen	EUR	93.7m	100%
Salutas Pharma GmbH	Barleben	EUR	42.1m	100%
Aeropharm GmbH	Rudolstadt	EUR	26 000	100%
Alcon Pharma GmbH	Freiburg im Breisgau	EUR	512 000	100%
CIBA Vision GmbH	Grosswallstadt	EUR	15.4m	100%
WaveLight GmbH	Erlangen	EUR	6.6m	100%
Greece				
Novartis (Hellas) S.A.C.I.	Metamorphosis / Athens	EUR	23.4m	100%
Hungary				
Novartis Hungary Healthcare Limited Liability Company	Budapest	HUF	545.6m	100%
Sandoz Hungary Limited Liability Company	Budapest	HUF	883.0m	100%
India				
Novartis India Limited	Mumbai	INR	123.5m	70.68%
Novartis Healthcare Private Limited	Mumbai	INR	60.0m	100%
Sandoz Private Limited	Mumbai	INR	32.0m	100%
Alcon Laboratories (India) Private Limited	Bangalore	INR	1.1bn	100%
Indonesia				
PT. Novartis Indonesia	Jakarta	IDR	7.7bn	100%
PT. CIBA Vision Batam	Batam	IDR	11.9bn	100%
Ireland				
Novartis Ireland Limited	Dublin	EUR	25 000	100%
Novartis Ringaskiddy Limited	Ringaskiddy, County Cork	EUR	2.0m	100%
Alcon Laboratories Ireland Limited	Cork City	EUR	541 251	100%
Israel				
Novartis Israel Ltd.	Petach Tikva	ILS	1 000	100%
Italy				
Novartis Farma S.p.A.	Origgio	EUR	18.2m	100%
Sandoz S.p.A.	Origgio	EUR	1.7m	100%
Sandoz Industrial Products S.p.A.	Rovereto	EUR	2.6m	100%
Alcon Italia S.p.A.	Milan	EUR	3.7m	100%
Japan				
Novartis Holding Japan K.K.	Tokyo	JPY	10.0m	100%
Novartis Pharma K.K.	Tokyo	JPY	6.0bn	100%
Ciba-Geigy Japan Limited	Tokyo	JPY	8.5m	100%
Sandoz K.K.	Tokyo	JPY	100.0m	100%
Alcon Japan Ltd.	Tokyo	JPY	500.0m	100%
Latvia				
Novartis Baltics SIA	Riga	EUR	3.0m	100%
Luxembourg				
Novartis Investments S.à r.l.	Luxembourg City [3]	USD	100.0m	100%
Novartis Finance S.A.	Luxembourg City	USD	100 000	100%

Malaysia				
Novartis Corporation (Malaysia) Sdn. Bhd.	Kuala Lumpur	MYR	3.3m	100%
Alcon Laboratories (Malaysia) Sdn. Bhd.	Petaling Jaya	MYR	1.0m	100%
CIBA Vision Johor Sdn. Bhd.	Kuala Lumpur	MYR	10.0m	100%
Mexico				
Novartis Farmacéutica, S.A. de C.V.	Mexico City	MXN	205.0m	100%
Sandoz, S.A. de C.V.	Mexico City	MXN	468.2m	100%
Alcon Laboratorios, S.A. de C.V.	Mexico City	MXN	5.9m	100%
Morocco				
Novartis Pharma Maroc SA	Casablanca	MAD	80.0m	100%
Netherlands				
Novartis Netherlands B.V.	Arnhem	EUR	1.4m	100%
Novartis Pharma B.V.	Arnhem	EUR	4.5m	100%
Sandoz B.V.	Almere	EUR	907 560	100%
Alcon Nederland B.V.	Arnhem	EUR	18 151	100%
New Zealand				
Novartis New Zealand Ltd	Auckland	NZD	820 000	100%

As at December 31, 2018			Share capital [1]	Equity interest
Norway				
Novartis Norge AS	Oslo	NOK	1.5m	100%
Pakistan				
Novartis Pharma (Pakistan) Limited	Karachi	PKR	3.9bn	99.99%
Panama				
Novartis Pharma (Logistics), Inc.	Panama City	USD	10 000	100%
Alcon Centroamerica S.A.	Panama City	PAB	1 000	100%
Peru				
Novartis Biosciences Perú S.A.	Lima	PEN	6.1m	100%
Philippines				
Novartis Healthcare Philippines, Inc.	Manila	PHP	298.8m	100%
Sandoz Philippines Corporation	Manila	PHP	30.0m	100%
Poland				
Novartis Poland Sp. z o.o.	Warsaw	PLN	44.2m	100%
Sandoz Polska Sp. z o.o.	Warsaw	PLN	25.6m	100%
Lek S.A.	Strykow	PLN	11.4m	100%
Alcon Polska Sp. z o.o.	Warsaw	PLN	750 000	100%
Portugal				
Novartis Portugal SGPS Lda.	Porto Salvo	EUR	500 000	100%
Novartis Farma - Produtos Farmacêuticos S.A.	Porto Salvo	EUR	2.4m	100%
Sandoz Farmacêutica Lda.	Porto Salvo	EUR	499 900	100%
Alcon Portugal-Produtos e Equipamentos Oftalmológicos Lda.	Porto Salvo	EUR	4.5m	100%
Romania				
Novartis Pharma Services Romania S.R.L.	Bucharest	RON	3.0m	100%
Sandoz S.R.L.	Targu-Mures	RON	105.2m	100%
Russian Federation				
Novartis Pharma LLC	Moscow	RUB	20.0m	100%
Novartis Neva LLC	St. Petersburg	RUB	500.0m	100%
ZAO Sandoz	Moscow	RUB	57.4m	100%
Alcon Farmacevtika LLC	Moscow	RUB	44.1m	100%
Saudi Arabia				
Saudi Pharmaceutical Distribution Co. Ltd.	Riyadh	SAR	26.8m	75%
Singapore				
Novartis (Singapore) Pte Ltd.	Singapore	SGD	100 000	100%
Novartis Singapore Pharmaceutical Manufacturing Pte Ltd	Singapore	SGD	45.0m	100%
Novartis Asia Pacific Pharmaceuticals Pte Ltd	Singapore	SGD	39.0m	100%
Alcon Singapore Manufacturing Pte. Ltd.	Singapore	SGD	101 000	100%
CIBA Vision Asian Manufacturing and Logistics Pte Ltd.	Singapore	SGD	1.0m	100%
Slovakia				
Novartis Slovakia s.r.o.	Bratislava	EUR	2.0m	100%
Slovenia				
Lek Pharmaceuticals d.d.	Ljubljana	EUR	48.4m	100%
Sandoz Pharmaceuticals d.d.	Ljubljana	EUR	1.5m	100%
South Africa				
Novartis South Africa (Pty) Ltd	Midrand	ZAR	86.3m	100%

Sandoz South Africa (Pty) Ltd	Kempton Park	ZAR	3.0m	100%
Alcon Laboratories (South Africa) (Pty) Ltd.	Midrand	ZAR	201 820	100%
South Korea				
Novartis Korea Ltd.	Seoul	KRW	24.5bn	98.55%
Alcon Korea Ltd.	Seoul	KRW	33.8bn	100%
Spain				
Novartis Farmacéutica, S.A.	Barcelona	EUR	63.0m	100%
Sandoz Farmacéutica S.A.	Madrid	EUR	270 450	100%
Sandoz Industrial Products S.A.	Les Franqueses del Vallés / Barcelona	EUR	9.3m	100%
Alcon Cusi S.A.	Barcelona	EUR	10.1m	100%
Abadia Retuerta S.A.	Sardón de Duero / Valladolid	EUR	6.0m	100%
Sweden				
Novartis Sverige AB	Stockholm	SEK	5.0m	100%
Switzerland				
Novartis Overseas Investments AG	Basel	CHF	1.0m	100%
Japat AG	Basel	CHF	50 000	100%
Novartis International AG	Basel	CHF	10m	100%
Novartis Holding AG	Basel [3]	CHF	100.2m	100%
Novartis International Pharmaceutical Investment AG	Basel [3]	CHF	100 000	100%
Novartis Ophthalmics AG	Fribourg	CHF	100 000	100%
Novartis Bioventures AG	Basel	CHF	100 000	100%
Novartis Forschungsstiftung	Basel	--	--	100%
Novartis Stiftung für Kaderausbildung	Basel	--	--	100%
Novartis Mitarbeiterbeteiligungsstiftung	Basel	--	--	100%
Novartis Stiftung für Mensch und Umwelt	Basel	--	--	100%
Stiftung der Novartis AG für Erziehung, Ausbildung und Bildung	Basel	--	--	100%
Novartis Pharma AG	Basel [3]	CHF	350.0m	100%
Novartis International Pharmaceutical AG	Basel [3]	CHF	100 000	100%
Novartis Pharma Services AG	Basel	CHF	20.0m	100%
Novartis Pharma Schweizerhalle AG	Muttenz	CHF	18.9m	100%
Novartis Pharma Stein AG	Stein	CHF	251 000	100%
Novartis Pharma Schweiz AG	Risch	CHF	5.0m	100%
Advanced Accelerator Applications International SA	Geneva	CHF	9.3m	99%
Advanced Accelerator Applications Switzerland SA	Geneva	CHF	200 000	99%
Sandoz AG	Basel	CHF	5.0m	100%
Sandoz Pharmaceuticals AG	Risch	CHF	100 000	100%
Alcon AG	Fribourg	CHF	100 000	100%
Alcon Management SA	Geneva	CHF	100 000	100%
Alcon Switzerland SA	Risch	CHF	100 000	100%
Alcon Pharmaceuticals Ltd.	Fribourg [3]	CHF	200 000	100%
Roche Holding AG	Basel	CHF	160.0m	33/6 [2]

As at December 31, 2018			Share capital [1]	Equity interest
Taiwan				
Novartis (Taiwan) Co., Ltd.	Taipei	TWD	170.0m	100%
Thailand				
Novartis (Thailand) Limited	Bangkok	THB	302.0m	100%
Alcon Laboratories (Thailand) Limited	Bangkok	THB	228.1m	100%
Turkey				
Novartis Saglik, Gida ve Tarim Ürünleri Sanayi ve Ticaret A.S.	Istanbul	TRY	98.0m	100%
Farmanova Saglik Hizmetleri Ltd. Sti.	Istanbul	TRY	6.7m	100%
Sandoz Ilaç Sanayi ve Ticaret A.S.	Istanbul	TRY	165.2m	99.99%
Sandoz Grup Saglik Ürünleri Ilaçlari Sanayi ve Ticaret A.S.	Gebze - Kocaeli	TRY	50.0m	100%
Alcon Laboratuvarlari Ticaret A.S.	Istanbul	TRY	25.2m	100%
Ukraine				
Sandoz Ukraine LLC	Kiev	UAH	8.0m	100%
United Arab Emirates				
Novartis Middle East FZE	Dubai	AED	7.0m	100%
United Kingdom				
Novartis UK Limited	Frimley / Camberley	GBP	25.5m	100%
Novartis Pharmaceuticals UK Limited	Frimley / Camberley	GBP	5.4m	100%
Novartis Grimsby Limited	Frimley / Camberley	GBP	250.0m	100%
Ziarco Group Limited	Frimley / Camberley	GBP	3 904	100%
Sandoz Limited	Frimley / Camberley	GBP	2.0m	100%
Alcon Eye Care UK Limited	Frimley / Camberley	GBP	550 000	100%
United States of America				
Novartis Corporation	East Hanover, NJ [3]	USD	72.2m	100%
Novartis Finance Corporation	New York, NY	USD	1 000	100%
Novartis Capital Corporation	New York, NY	USD	1	100%
Novartis Services, Inc.	East Hanover, NJ	USD	1	100%
Novartis US Foundation	New York, NY	--	--	100%
Novartis Pharmaceuticals Corporation	East Hanover, NJ [3]	USD	5.2m	100%
Novartis Institutes for BioMedical Research, Inc.	Cambridge, MA	USD	1	100%
CoStim Pharmaceuticals Inc.	Cambridge, MA	USD	1	100%
Encore Vision, Inc.	New York, NY	USD	1	100%

Endocyte, Inc.	Lafayette, IN	USD	1	100%
Navigate BioPharma Services, Inc.	Carlsbad, CA	USD	100	100%
Reprixys Pharmaceuticals Corporation	East Hanover, NJ	USD	1	100%
Spinifex Pharmaceuticals, Inc.	Wilmington, NC	USD	1	100%
Novartis Institute for Functional Genomics, Inc.	San Diego, CA	USD	1 000	100%
Advanced Accelerator Applications USA, Inc.	New York, NY	USD	1	99%
AveXis, Inc.	Bannockburn, IL	USD	1	100%
Sandoz Inc.	Princeton, NJ	USD	25 000	100%
Oriel Therapeutics, Inc.	Durham, NC	USD	1	100%
Fougera Pharmaceuticals Inc.	Melville, NY	USD	1	100%
Eon Labs, Inc.	Princeton, NJ	USD	1	100%
Alcon Laboratories, Inc.	Fort Worth, TX [3]	USD	1 000	100%
Alcon Refractivehorizons, LLC	Fort Worth, TX	USD	10	100%
Alcon Research, Ltd.	Fort Worth, TX [3]	USD	12.5	100%
Alcon Lensx, Inc.	Fort Worth, TX	USD	1	100%
Alcon Laboratories Holding Corporation	Fort Worth, TX	USD	10	100%
WaveLight, Inc.	Sterling, VA	USD	1	100%
Tear Film Innovations, Inc.	Fort Worth, TX	USD	1	100%
TrueVision Systems, Inc.	Fort Worth, TX	USD	1	100%
CIBA Vision Corporation LLC	Duluth, GA [3]	USD	1.3m	100%
Novartis Vaccines and Diagnostics, Inc.	Cambridge, MA	USD	3	100%
ClarVista Medical, Inc.	Aliso Viejo, CA	USD	1	100%
Transcend Medical, Inc.	Lake Forest, IL	USD	1	100%
Venezuela				
Novartis de Venezuela, S.A.	Caracas	VES	14	100%
Alcon Pharmaceutical, C.A.	Caracas	VES	55	100%

In addition, the Group is represented by subsidiaries and associated companies in the following countries: Bosnia/Herzegovina, Bulgaria, Dominican Republic, Guatemala, Kenya, the Former Yugoslav Republic of Macedonia, Nigeria, Puerto Rico and Uruguay

[1] Share capital may not reflect the taxable share capital and does not include any paid-in surplus

[2] Approximately 33% of voting shares; approximately 6% of total net income and equity attributable to Novartis

[3] Significant subsidiary under SEC Regulation S-X Rule 1-02(w)

m = million; bn = billion

Report of Independent Registered Public Accounting Firm

To the shareholders and Board of Directors of Novartis AG

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Novartis AG and its subsidiaries (the "Company") as of December 31, 2018 and December 31, 2017, and the related consolidated income statements, consolidated statements of comprehensive income, consolidated statements of changes in equity, and consolidated statements of cash flow for each of the three years in the period ended December 31, 2018, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control – Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and December 31, 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018 in conformity with International Financial Reporting Standards ("IFRS") as issued by the International Accounting Standards Board. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control – Integrated Framework* (2013) issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the "Report of Novartis Management on Internal Control Over Financial Reporting" appearing under Item 15(b). The Board of Directors is also responsible for the preparation of the consolidated financial statements in accordance with IFRS, and for such internal control as the Board of Directors determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with IFRS. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with IFRS, and that receipts and expenditures of the company are

being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ PricewaterhouseCoopers AG

Basel, Switzerland

January 29, 2019

We have served as the Company's or its predecessors' auditor since at least 1940. We have not been able to determine the specific year we began serving as auditor of the Company's predecessors.