Patented Medicine Prices Review Board

Conseil d'examen du prix des médicaments brevetés

CELEBRATING 30 YEARS

ANNUAL REPORT 2016

Patented Medicine Prices Review Board

Canada

STATISTICAL HIGHLIGHTS 2016

REGULATORY MANDATE

- **1,435** patented drug products for human use were reported to the PMPRB, including **128** new drug products.
- **12** Voluntary Compliance Undertakings were accepted as at December 31, 2016.
- **$5.0 million** in excess revenues were offset by way of payment to the Government of Canada, in addition to price reductions.

REPORTING MANDATE

SALES TRENDS:

- There were **$15.5 billion** in sales of patented drug products in Canada in 2016, an increase of **2.6%** from 2015.
- Patented drug products accounted for **60.8%** of the total drug sales in Canada, a decrease from **61.6%** in 2015.

PRICE TRENDS:

- Prices of existing patented drug products were stable, while the Consumer Price Index rose by **1.4%**.
- Canadian prices were **fourth highest** among the seven PMPRB comparator countries, lower than prices in Switzerland, Germany and the US.

RESEARCH AND DEVELOPMENT R&D-TO-SALES RATIOS UNCHANGED IN 2016:

- **4.4%** for all patentees, unchanged from 2015.
- **4.9%** for Innovative Medicines Canada members, unchanged from 2015.

RESEARCH AND DEVELOPMENT (R&D):

- **$918.2 million** in total R&D expenditures were reported by patentees, an increase of **5.7%** over 2015.
- **$769.9 million** in R&D expenditures were reported by Innovative Medicines Canada members, an increase of **0.3%** over 2015.

The Patented Medicine Prices Review Board
Standard Life Centre, Box L40
333 Laurier Avenue West, Suite 1400
Ottawa, ON K1P 1C1

Tel.: 1-877-861-2350
Fax: 613-288-9643
TTY: 613-288-9654

Email: pmprb@pmprb-cepmb.gc.ca
Web: www.pmprb-cepmb.gc.ca
Twitter: @PMPRB_CEPMB

ISSN: 1495-0561
Catalogue number: H78E-PDF

September 29, 2017

The Honourable Ginette Petitpas Taylor, P.C., M.P.
Minister of Health
House of Commons
Ottawa, Ontario
K1A 0A6

Dear Minister:

I have the pleasure to present to you, in accordance with sections 89 and 100 of the *Patent Act*, the Annual Report of the Patented Medicine Prices Review Board for the year ended December 31, 2016.

Yours very truly,

Dr. Mitchell Levine
Acting Chairperson

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACTING CHAIRPERSON'S MESSAGE

As Acting Chairperson, I am pleased to present the Patented Medicine Prices Review Board's (PMPRB) 2016 Annual Report. The PMPRB is a consumer protection agency with a dual regulatory and reporting mandate. Its regulatory mandate is to ensure that the prices of patented medicines sold in Canada are not excessive. Its reporting mandate is to provide stakeholders with information on the latest trends in pharmaceutical sales and pricing and on pharmaceutical research and development (R&D) spending in Canada.

In December 2015, the PMPRB published its much anticipated 2015–2018 Strategic Plan, an important turning point in the organization's history as it looks to reform how it carries out its consumer protection mandate in light of recent significant changes in its operating environment. 2016 marked the first full year that the strategic objectives in that document were in effect at the PMPRB and their impact was made apparent on a number of fronts. Chief among these was the *Rethinking the Guidelines* consultation initiative, which is a key initiative in the PMPRB's short term efforts to modernize its regulatory framework. Phase 1 of this consultation, which ran from June to October 2016, sought stakeholder and public feedback on the *Guidelines Modernization Discussion Paper*. The written submissions received from interested parties in response to the discussion paper have been made available online and the PMPRB-led consultation process will resume following publication of the Minister of Health's recently proposed amendments to the *Patented Medicines Regulations* in Part I of the *Canada Gazette*, which is anticipated to take place in the fall.

The PMPRB's renewed emphasis on consumer-focused regulation made for another busy year of compliance and enforcement activity in 2016 with the acceptance of 12 Voluntary Compliance Undertakings (VCUs) and the paying back of excess revenues totalling 5,041,226.52 in addition to reductions in price for the affected drug products. As at May 31, 2017, an additional VCU was accepted in the amount of $31,000,000.00 from GlaxoSmithKline, a record one-time excess revenue repayment to the Government of Canada. In addition, the PMPRB's first excessive price hearing in several years, and the first such case in which both public and private insurers sought to participate, continued to wind its way to disposition on the merits, with closing argument taking place in the spring of 2017.

In terms of its reporting mandate, the PMPRB continued to build strategic partnerships and raise public awareness of its mandate by being more responsive to the specific information needs of payers while at the same time expanding on the scope of its reporting to appeal to a broader stakeholder audience. An example of the latter is the release of the first edition of the PMPRB's new *Meds Entry Watch* publication under the NPDUIS banner. This is an annual publication which explores the market entry dynamics of new drugs launched in Canada and other international markets and is designed to inform decision makers, researchers and patients of the evolving market dynamics associated with emerging drug therapies.

An example of the former is the PMPRB's *Market Intelligence Report on Biologic Response Modifying Agents*, the first in a series of such reports which are designed to provide greater insight on specific therapeutic market segments of particular importance to public and private payers in Canada.

2016 saw many changes in our regulatory and reporting functions begin to take shape at the PMPRB which may have a profound effect on the pharmaceutical environment, but the departure of some cherished colleagues this past year was a change that was felt even more keenly and immediately by those of us within the organization. In June, my friend and fellow Board member, Mary Catherine Lindberg, completed her second and final term on the Board. Over the course of her tenure as a Board member, Ms. Lindberg made an invaluable contribution to the leadership of the PMPRB, particularly in her last five years as Chairperson, where she set the PMPRB on its current trajectory towards renewal, reform, and framework modernization. In December, Ginette Tognet, our Director of Regulatory Affairs and Outreach, announced her retirement after a long and illustrious career in the public service. Ms. Tognet played a formative role in shaping the professional lives of many staff who worked with her these last 18 years at the PMPRB. Ms. Lindberg and Ms. Tognet will be sorely missed and we wish them the very best in their future endeavours.

In closing, as many of our readers will know, Budget 2017 proposed a significant increase in funding for the PMPRB, as part of the Government's commitment to making prescription drugs more accessible and affordable for Canadians. We take this as a vote of confidence in our potential to play a more meaningful and relevant role in the sustainability of Canada's health systems. December of 2017 will mark the 30 year anniversary of the PMPRB and the timing could not be more opportune to celebrate our past success and embrace what looks to be a very promising future.

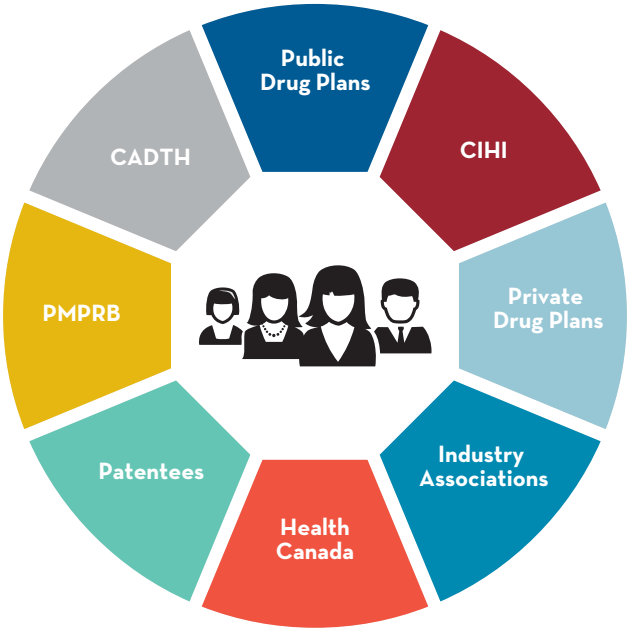
Dr. Mitchell Levine
Acting Chairperson

ABOUT THE PATENTED MEDICINE PRICES REVIEW BOARD: ACTING IN THE INTEREST OF CANADIANS

The Patented Medicine Prices Review Board (PMPRB) was created in 1987 as the consumer protection "pillar" of Bill C-22, legislation which also strengthened the patent rights of pharmaceutical manufacturers in order to spur investment in research and development (R&D) in Canada.

The PMPRB protects consumers by regulating the price of patented drugs at the factory gate level and by keeping a vigilant eye on pricing trends and industry R&D. Through our reporting function, we serve as an objective, centralized source of information on pharmaceutical trends for policy makers, drug companies, private insurers and other stakeholders.

Protecting Consumers in a Complex Marketplace



The PMPRB is an independent, quasi-judicial body established by Parliament in 1987 under the *Patent Act* (Act).

The PMPRB is a consumer protection agency with a dual regulatory and reporting mandate. Through its regulatory mandate, it ensures that the prices of patented medicines sold in Canada are not excessive. The PMPRB also reports on trends in pharmaceutical sales and pricing for all medicines and on research and development (R&D) spending by patentees. Its reporting mandate provides pharmaceutical payers and policy makers with information to make rational, evidence-based reimbursement and pricing decisions.

The PMPRB is part of the Health Portfolio, which includes Health Canada, the Public Health Agency of Canada, the Canadian Institutes of Health Research and the Canadian Food Inspection Agency. The Health Portfolio supports the Minister of Health in maintaining and improving the health of Canadians.

Although part of the Health Portfolio, because of its quasi-judicial responsibilities, the PMPRB carries out its mandate at arm's length from the Minister of Health, who is responsible for the sections of the Act pertaining to the PMPRB. It also operates independently of other bodies such as Health Canada, which approves drugs for marketing in Canada based on their safety, efficacy and quality; federal, provincial and territorial public drug plans, which approve the listing of drugs on their respective formularies for reimbursement purposes; and the Common Drug Review, administered by the Canadian Agency for Drugs and Technologies in Health (CADTH), which recommends drugs that should qualify for reimbursement by participating public drug plans.

The PMPRB is composed of Board Staff, who are public servants responsible for carrying out the organization's day to day work, and Board members, Governor-in-Council appointees who serve as hearing panel members in the event of a dispute between Board Staff and a patentee over the price of a patented medicine.

WE ARE AN INDEPENDENT AUTHORITY

that administers provisions of Canada's *Patent Act* related to patented medicines. As a member of the Health Portfolio, we contribute to sustainable health care systems for all Canadians.

JURISDICTION

REGULATORY

The PMPRB regulates the "factory gate" ceiling prices for all patented drug products sold in Canadian markets; that is, the prices at which patentees (companies) sell their products to wholesalers, hospitals, pharmacies and other large distributers. The PMPRB does not regulate the prices of non-patented drugs.

The PMPRB's jurisdiction is not limited to drug products for which the patent is for the active ingredient. Rather, its jurisdiction also covers drugs for which the patents relate to, but are not limited to, the processes of manufacture, the delivery system or dosage form, the indication/use and any formulations.

Under the Act, patentees (which include any parties who benefit from patents regardless of whether they are owners or licencees under those patents and regardless of whether they operate in the "brand" or "generic" sector of the market) are required to inform the PMPRB of their intention to sell a new patented drug product. Upon the sale of a patented drug product, patentees are required to file price and sales information at introduction and, thereafter, until all patents pertaining have expired. Although patentees are not required to obtain approval of the price before a drug is sold, they are required to comply with the Act to ensure that the prices of patented drug products sold in Canada are not excessive.

Board Staff reviews the prices that patentees charge for each individual strength and form of a patented drug product. If the price of a patented medicine appears to be excessive, Board Staff will first try to reach a consensual resolution with the patentee. Failing this, the Chairperson can decide that the matter should proceed to a hearing. At the hearing, a panel composed of Board members acts as a neutral arbiter between Board Staff and the patentee. If a panel finds that the price of a patented medicine is excessive, it can order a reduction of the price to a non-excessive level. It can also order a patentee to make a monetary payment to the Government of Canada in the amount of the excess revenues earned and, in cases where the panel determines there has been a policy of excessive pricing, it can double the amount of the monetary payment.

REPORTING

The PMPRB is a reliable, objective source of information on drug prices, pharmaceutical trends and R&D investment. The PMPRB reports annually to Parliament through the Minister of Health on its price review activities, the prices of patented medicines and price trends of all prescription drugs, and on the R&D expenditures reported by pharmaceutical patentees, as required by the Act.

Pursuant to an agreement by the federal, provincial and territorial (F/P/T) Ministers of Health in 2001, and at the request of the Minister of Health pursuant to section 90 of the Act, the PMPRB conducts critical analyses of price, utilization and cost trends for patented and non-patented prescription drugs under the National Prescription Drug Utilization Information System (NPDUIS). The PMPRB publishes the results of NPDUIS analyses in the form of research papers, posters, presentations and briefs. This program provides F/P/T governments and other interested stakeholders with a centralized, credible source of information on pharmaceutical trends.

Among other initiatives, the PMPRB also hosts various forums, such as webinars, research forums and information sessions, with academics and policy experts to discuss current research into pharmaceutical use in Canada and emerging areas for study.

COMMUNICATIONS AND OUTREACH

The PMPRB is committed to ensuring that stakeholders are consulted and informed of changes in the operating environment and are promptly advised of any updates to the regulatory process. Over the past year, the Regulatory Affairs and Outreach Branch continued to provide regular outreach sessions for patentees.

The PMPRB has also sustained its communication activities, continuing to take a proactive and plain-language approach to its traditional and social media presence. This included press release distribution, an emphasis on targeted social media campaigns, direct engagement with the public via social media as well as more traditional means (e.g., e-mail and telephone) and engagement with domestic, international and specialized media including the CBC, CTV, Radio-Canada, La Presse, The Globe and Mail, Toronto Star, the Canadian Medical Association Journal, Benefits Canada, CBS, Bloomberg News, Boston Globe, and VICE News.

The PMPRB has recently made additional improvements to its website to enhance accessibility of content, and continues to respond to public enquiries and inform the public by publishing updates of Board proceedings and decisions, and research results.

1,435 PATENTED DRUG PRODUCTS
were reported to the PMPRB in 2016.

GOVERNANCE

The Board consists of up to five members who serve on a part-time basis. Board Members, including a Chairperson and a Vice-Chairperson, are appointed by the Governor in Council. The Chairperson is designated under the Act as the Chief Executive Officer of the PMPRB, with the authority and responsibility to supervise and direct its work.

The Members of the Board are collectively responsible for the implementation of the applicable provisions of the Act. Together, they approve the issuance of the guidelines, rules and other policies of the Board as provided by the Act and consult, as necessary, with stakeholders including the provincial and territorial Ministers of Health and representatives of consumer groups and the pharmaceutical industry.

MEMBERS OF THE BOARD

CHAIRPERSON

The position of Chairperson is currently vacant.

VICE-CHAIRPERSON/ACTING CHAIRPERSON

Mitchell Levine,
BSc, MSc, MD, FRCPC, FISPE

Dr. Mitchell Levine was appointed Member and Vice-Chairperson of the Board on March 3, 2011. He was reappointed as Vice-Chairperson for a second five year term on November 10, 2016.

Dr. Levine is a professor in the departments of Medicine and Clinical Epidemiology and Biostatistics in the Faculty of Health Sciences at McMaster University in Hamilton, Ontario. He is also Director of the Centre for Evaluation of Medicines at St. Joseph's Healthcare in Hamilton.

Dr. Levine received his medical degree from the University of Calgary and did postgraduate medical training in Internal Medicine (FRCPC) and in Clinical Pharmacology at the University of Toronto. He received an MSc degree in Clinical Epidemiology from McMaster University.

Prior to his appointment to the Board, Dr. Levine was a member of the PMPRB's Human Drug Advisory Panel. He currently acts on an ad hoc basis as a clinical pharmacology consultant to the Ontario Ministry of Health and Long-Term Care. In addition, he is Editor-in-Chief of the *Journal of Population Therapeutics and Clinical Pharmacology* and Associate Editor of the *ACP Journal Club: Evidence-Based Medicine*.

MEMBERS

Normand Tremblay,
ASC, MSc, Adm.A, CMC

Normand Tremblay was appointed Member of the Board on May 31, 2012. His term expires on May 31, 2017.

Mr. Tremblay is President and Chief Executive Officer of an innovative company (diaMentis inc.) which is currently developing a mental health diagnostic tool, and teaches at the Université du Québec in the area of management, project management and innovation. He brings to the Board a vast experience and expertise in strategic and operational planning and organizational development. For over 20 years, Mr. Tremblay has been active in various areas of the business field, nationally and internationally. He has also sat on investment committees and a number of administrative boards, including the National Research Council of Canada (NRC) from 2007 to 2010. Mr. Tremblay holds a master's degree in project management (MSc) with a specialization in best practices in product development from the Université du Québec à Trois Rivières, as well as a certificate in business governance from Laval University and is a Certified Management Consultant. He is also a member of the Order of Certified Administrators of Québec.

Carolyn Kobernick, B.C.L., LL.B.

Carolyn Kobernick was appointed Member of the Board on June 13, 2014.

Ms. Kobernick is a lawyer and former public servant. Prior to her retirement in 2013, Ms. Kobernick was Assistant Deputy Minister of Public Law for the Department of Justice. As principal counsel to the Minister of Justice and Attorney General of Canada, Ms. Kobernick was instrumental in the development and delivery of policy for the Public Law sector. In addition to identifying key strategic, legal and operational matters, she tackled cross-cutting national issues as the liaison between the Department of Justice and other government organizations.

Ms. Kobernick joined the Department of Justice in 1980, where she practiced litigation and tax law at the Toronto Regional office. In 1991, she was appointed Senior General Counsel, Deputy Head, Business and Regulatory Law Portfolio, after working for over a decade in the legal services unit of the Correctional Service of Canada. In her role as Senior General Counsel, Ms. Kobernick was involved in complex federal policy and operational issues, including the Alaska Pipeline and Mackenzie Valley Pipeline files and the Sponsorship file.

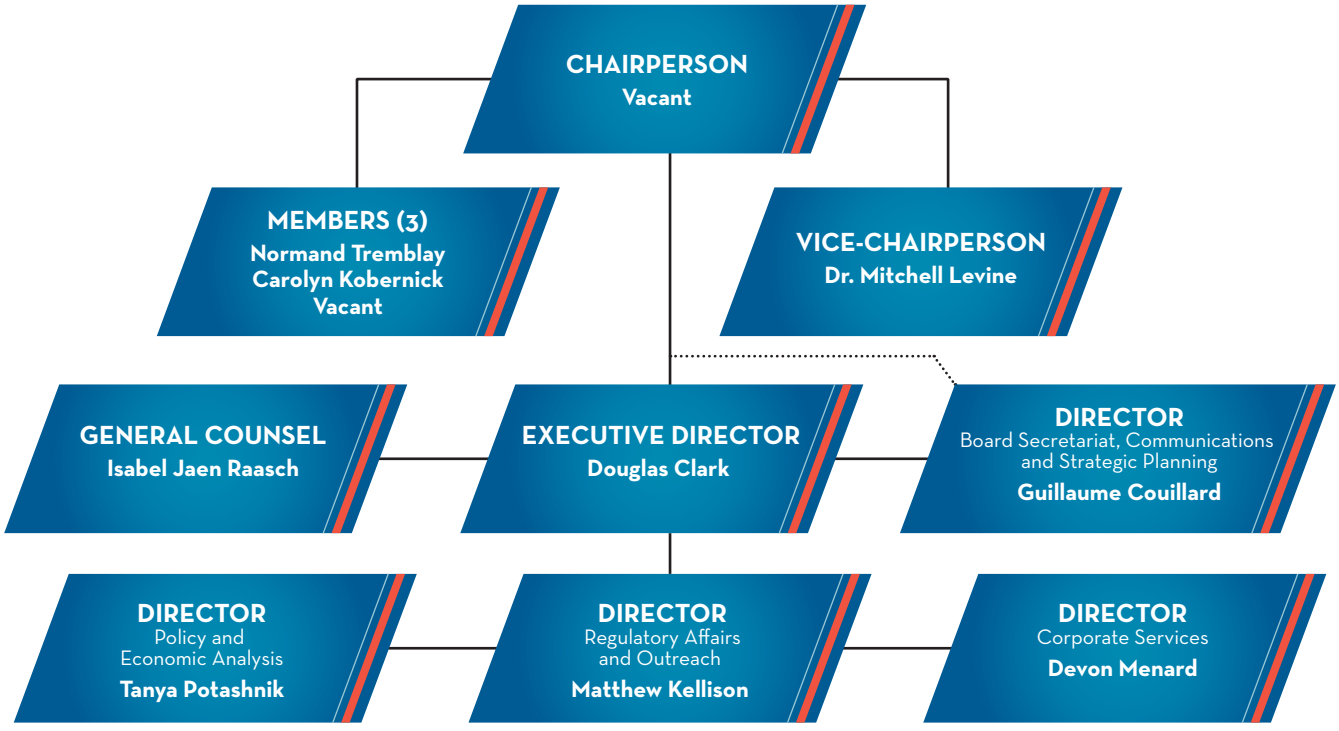
During her career with the public service, Ms. Kobernick actively participated in many high-profile initiatives. She was Chair of the National Legal Advisory Committee and Departmental Champion for Aboriginal People and Gender Equity. She also served as the Senior Department of Justice official at the Domestic Affairs Cabinet Committee, and was appointed Senior Legal Advisor to the Government of Canada for the 2004 Gomery Inquiry.

Ms. Kobernick holds a B.C.L. and L.L.B. from McGill University and is a member of the bar of Ontario. In 2012 she obtained a Certificate in Adjudication for Administrative Agencies, Boards and Tribunals from the Osgoode Hall Law School and the Society of Ontario Adjudicators and Regulators.

As at May 31, 2017 two Member positions are vacant.

ORGANIZATIONAL STRUCTURE AND STAFF

PMPRB Organizational Chart



EXECUTIVE DIRECTOR

The Executive Director is responsible for advising the Board and for the leadership and management of the Staff.

REGULATORY AFFAIRS AND OUTREACH

The Regulatory Affairs and Outreach Branch reviews the prices of patented drug products sold in Canada to ensure that they are not excessive; encourages patentees to comply voluntarily with the Board's Guidelines; implements related compliance policies; and investigates complaints into the prices of patented medicines. This branch also informs and educates patentees on the Board's Guidelines and filing requirements.

POLICY AND ECONOMIC ANALYSIS

The Policy and Economic Analysis Branch develops policy and strategic advice; makes recommendations on possible amendments to the Board's Guidelines; conducts research and analysis on the prices of drugs, pharmaceutical market developments and R&D trends; and publishes studies aimed at providing F/P/T governments and other interested stakeholders with centralized, credible information in support of evidence based policy.

CORPORATE SERVICES

The Corporate Services Branch provides advice and services in relation to human resources management; facilities; procurement; health, safety and security; information technology; and information management. It is also responsible for financial planning and reporting, accounting operations, audit and evaluation, and liaising with federal central agencies on these topics.

BOARD SECRETARIAT, COMMUNICATIONS AND STRATEGIC PLANNING

The Board Secretariat, Communications and Strategic Planning Branch develops and manages the PMPRB's communications, media relations, and public enquiries; manages the Board's meeting and hearing processes, including the official record of proceedings; and coordinates activities pursuant to the *Access to Information Act* and the *Privacy Act*. It is also responsible for strategic planning and reporting.

GENERAL COUNSEL

The General Counsel advises the PMPRB on legal matters and leads the legal team representing Board Staff in proceedings before the Board.

BUDGET

In 2016–17, the PMPRB had a budget of $10.965 million and an approved staff level of 71 full-time equivalent employees.

Table 1. Budget and Staffing

	2015–16	2016–17	2017–18
Budget*	$10.945 M	$10.965 M	$10.866 M
Salaries	$6.937 M	$6.963 M	$6.896 M
Operating	$1.538 M	$1.532 M	$1.532 M
Special Purpose Allotment**	$2.470 M	$2.470 M	$2.438 M
Full Time Employees (FTEs)	71	71	66

* The amounts are based on the Main Estimates

** The Special Purpose Allotment is reserved strictly for external costs of public hearings (legal counsel, expert witnesses, etc.). Any unspent funds are returned to the Consolidated Revenue Fund.

REGULATING PRICES OF PATENTED MEDICINES: CONTINUED VIGILANCE NECESSARY

With the population aging and using more prescription drugs—and sometimes more expensive types of drugs—Canada's spending on pharmaceuticals is expected to increase significantly in the years to come. Medical advancements have introduced many innovative new drugs to the Canadian marketplace to improve existing treatments and to treat conditions that previously had no pharmaceutical therapy. These include high-cost orphan drugs, biologics and cancer drugs. The PMPRB plays an important role in regulating the prices of new and existing patented drug products to ensure the sustainability of Canadian health care systems.

The PMPRB protects the interests of Canadian consumers by ensuring that the prices of patented medicines sold in Canada are not excessive. It does this by reviewing the prices that patentees charge for each individual patented drug product to wholesalers, hospitals and pharmacies and by taking action so that patentees reduce their prices and pay back excess revenues where appropriate.

REPORTING REQUIREMENTS

Patentees are required by law to file information pertaining to the sale of their drug products in Canada. The *Patent Act* (Act) along with the *Patented Medicines Regulations* (Regulations) set out the filing requirements and Board Staff reviews pricing information on an ongoing basis to ensure that prices are not excessive until all patents pertaining have expired.

There are several factors used for determining whether a drug product is priced excessively, as outlined in section 85 of the Act. The *Compendium of Policies, Guidelines and Procedures* (Guidelines) details the price tests used by Board Staff to determine whether the price charged by a patentee falls within the maximum allowable price. The Guidelines were developed in consultation with stakeholders, including the provincial and territorial Ministers of Health, consumer groups, and the pharmaceutical industry. When an investigation determines that the price of a patented drug product may be excessive, the patentee is offered the opportunity to voluntarily lower its price and/or refund its excess revenues through a Voluntary Compliance Undertaking (VCU). If the patentee disagrees with the findings of the investigation and chooses not to submit a VCU, the Chairperson of the Board may issue a Notice of Hearing (NOH). After hearing the evidence, if the Board finds that a price is excessive, it can issue an Order requiring a patentee to reduce that price and/or refund excess revenues. A patentee also has the option of submitting a VCU to resolve the matter after the NOH has been issued. Copies of the Act, the Regulations, the Guidelines, and the *Patentee's Guide to Reporting* are posted on the PMPRB's website.

FAILURE TO REPORT

The PMPRB relies on patentees' full and timely disclosure of any and all patented drug products being sold in Canada to which a patent pertains. In 2016, 6 drug products were reported to the PMPRB for the first time despite being patented and sold prior to 2016. In addition, 2 drug products previously reported to the PMPRB, and for which the patents had expired, were reported again as having another patent pertaining. Table 2 lists the drug products that were patented and sold in Canada prior to being reported to the PMPRB.

Table 2. Failure to Report the Sale of Patented Drugs

Currently sold by	Brand name	Generic name	Year medicine came under PMPRB's jurisdiction	Year medicine came under PMPRB's jurisdiction with subsequent patent
BGP Pharma ULC	Creon Minimicrospheres (2 DINs)	pancreatin	2015	
Jazz Pharmaceuticals, PLC	Defitelio (1 DIN)	defibrotide	2014	
Ipsen Biopharmaceuticals Canada Inc.	Dysport Aesthetic (1 DIN)	abobotulinumtoxinA	2013	
CSL Behring Canada Inc.	Corifact (2 DINs)	factor XIII concentrate, human	2014	
Allergan Inc.	Trelstar (2 DINs)	triptorelin pamoate	2006	2011

FAILURE TO FILE PRICE AND SALES DATA (FORM 2)

Failure to file refers to the complete or partial failure of a patentee to comply with the regulatory filing requirements outlined in the Act and the Regulations. There were two Board Orders issued for failure to file in 2016.

SCIENTIFIC REVIEW

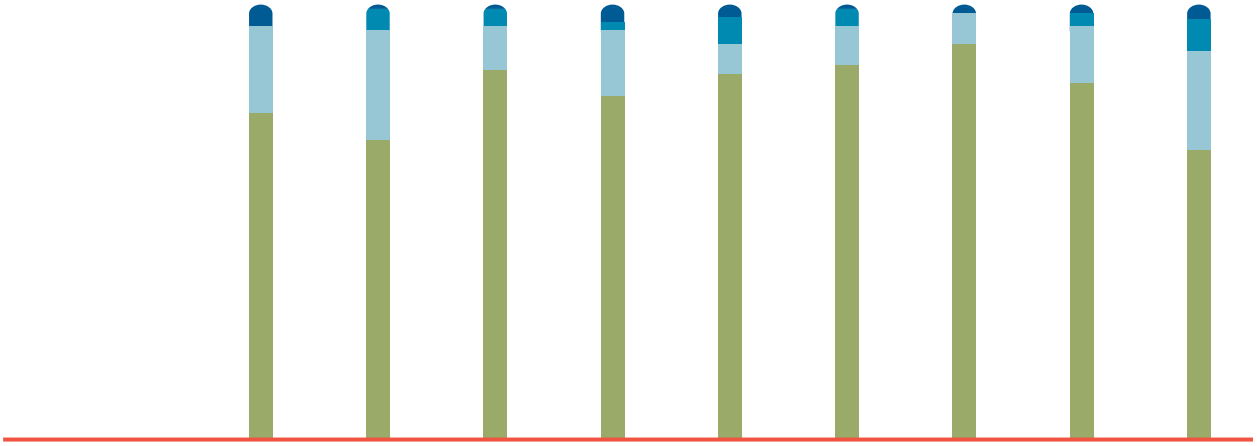
HUMAN DRUG ADVISORY PANEL

All new patented drug products reported to the PMPRB are subject to a scientific evaluation as part of the price review process. The Human Drug Advisory Panel (HDAP) was established by the Board to provide independent expertise and advice to Board Staff. HDAP conducts a review when a patentee makes a claim regarding therapeutic improvement. Panel members review and evaluate the appropriate scientific information available, including any submission by a patentee with respect to the proposed level of therapeutic improvement, the selection of drug products to be used for comparison purposes, and comparable dosage regimens.

HDAP evaluates the therapeutic benefit of new patented drug products according to the following definitions:

- **Breakthrough:** A drug product that is the first one to be sold in Canada to effectively treat a particular illness or effectively address a particular indication.
- **Substantial Improvement:** A drug product that, relative to other drug products sold in Canada, provides substantial improvement in therapeutic effects.
- **Moderate Improvement:** A drug product that, relative to other drug products sold in Canada, provides moderate improvement in therapeutic effects.
- **Slight or No Improvement:** A drug product that, relative to other drug products sold in Canada, provides slight or no improvement in therapeutic effects.

Figure 1. Breakdown of New Patented Drug Products by Therapeutic Benefit



	2010 Intro	2011 Intro	2012 Intro	2013 Intro	2014 Intro	2015 Intro	2016 Intro	Overall 2016	Overall 2016 Rev Share
Slight/No Improvement	51	76	70	91	87	73	116	564	66.6
Moderate	14	27	8	17	7	8	9	90	22.8
Substantial Improvement	0	5	3	2	7	3	0	20	7.3
Breakthrough	3	1	1	5	3	1	3	17	3.3

Source: PMPRB

Figure 1 illustrates the breakdown of new patented drug products in the year of introduction by therapeutic benefit for 2010 to 2016. The largest percentage of patented drug products (82%) introduced since 2010 offer Slight or No Improvement in therapeutic benefit over existing therapies.[1] The bar "Overall 2016" represents the therapeutic benefit breakdown for all new patented drug products introduced from 2010 to 2016. The bar "Overall 2016 Revenue Share" illustrates the revenue share by therapeutic benefit for all new patented drug products introduced from 2010 to 2016.

PRICE REVIEW

The PMPRB reviews the average price of each strength of an individual dosage form of each patented medicine. In most cases, this unit is consistent with the Drug Identification Number (DIN) assigned by Health Canada at the time the drug is approved for sale in Canada.

NEW PATENTED DRUG PRODUCTS REPORTED TO THE PMPRB IN 2016

For the purpose of this report, a new patented drug product in 2016 is defined as any patented drug product first sold in Canada, or previously sold but first patented, between December 1, 2015, and November 30, 2016.

There were 128 new patented drug products for human use reported as sold in 2016. Some are one or more strengths of a new active substance and others are new presentations of existing medicines. Of these 128 new patented drug products, 3 (2.3%) were being sold in Canada prior to the issuance of the Canadian patent that brought them under the PMPRB's jurisdiction. Table 3 shows the year of first sale for these drug products.

Table 3. Number of New Patented Drug Products for Human Use in 2016 by Year First Sold

Year first sold	No. of drug products
2016	125
2015	2
2013	1
Total	128

The list of *New Patented Medicines Reported to PMPRB* is available on the PMPRB's website under "Regulating Prices". This list includes information on the status of the review (*i.e.*, whether the medicine is under review, within the Guidelines, under investigation, or subject to a VCU or Notice of Hearing).

Figure 2 illustrates the number of new patented drug products for human use reported to the PMPRB from 1989 to 2016.

Of these 128 new patented drug products, the prices of 70 had been reviewed as of March 31, 2017:

- 45 were found to be within the thresholds set out in the Guidelines;
- 13 were at a level that appeared to exceed the thresholds set out in the Guidelines by an amount that did not trigger the investigation criteria; and
- 12 were at levels that appeared to exceed the thresholds set out in the Guidelines and resulted in investigations being commenced.

For a complete list of the 128 new patented drug products and their price review status, see *Appendix 2*.

PRICE REVIEW OF EXISTING PATENTED DRUG PRODUCTS FOR HUMAN USE IN 2016

For the purpose of this report, existing patented drug products include all patented drug products that were first sold and reported to the PMPRB prior to December 1, 2015.

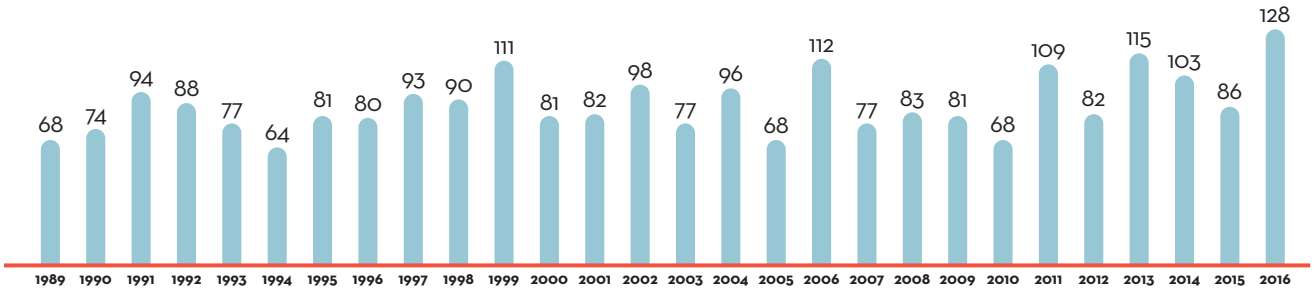
At the time of this report, there were 1307 existing patented drug products:

- 856 were priced within the thresholds set out in the Guidelines;
- 254 had prices that exceeded the thresholds set out in the Guidelines by an amount that did not trigger the investigation criteria;
- 89 were the subject of investigations:
  - 3 were opened as the result of introductory pricing in 2013;
  - 2 were opened as the result of introductory pricing in 2014;
  - 8 were opened as the result of introductory pricing in 2015; and
  - 76 were opened on the basis of year-over-year prices;
- 8 were under review;
- 39 were identified as patented generic drugs;
- 60 were the subject of Voluntary Compliance Undertakings; and
- 1 is the subject of a hearing.

In addition, 1 drug product remains the subject of a hearing although no longer patented in 2016.

A summary of the status of the price review of the new and existing patented drug products for human use in 2016 is provided in Table 4.

Figure 2. New Patented Drug Products for Human Use



Source: PMPRB

Table 4. Patented Drug Products for Human Use Sold in 2016—Status of Price Review as of March 31, 2017

	New drug products introduced in 2016	Existing drug products	Total
Total	128	1307	1435
Within Guidelines Thresholds	45	856	901
Under Review	58	8	66
Does Not Trigger Investigation	13	254	267
Under Investigation	12	89	101
Subject to Voluntary Compliance Undertakings[1]	0	60	60
Price Hearings	0	1	1
Compliance status not reported as of 2016[2]	0	39	39

[1] The GlaxoSmithKline patent audit, which was described in the 2015 Annual Report, resulted in a Voluntary Compliance Undertaking (VCU) that included 45 drug products for a total of 60 drug products that were subject to a VCU for 2016.

[2] As indicated in the February 2017 *NEWSletter*, an investigation of the price of a patented generic drug will only be commenced in accordance with the *Policy on Generic Medicines*.

UPDATE FROM THE 2015 ANNUAL REPORT

- Reviews of all drug products for human use that were reported as Under Review in the 2015 Annual Report have been completed.
- 59 of the 93 investigations reported in the 2015 Annual Report resulted in one of the following:
  - the closure of the investigation where it was concluded that the price was within the thresholds set out in the Guidelines;
  - a Voluntary Compliance Undertaking (VCU) by the patentee to reduce the price and offset excess revenues through a payment and/or a reduction in the price of another patented drug product (see *Voluntary Compliance Undertakings*); or
  - a public hearing to determine whether the price was excessive, including any remedial Order determined by the Board (see *Hearings*).

PATENTED OVER-THE-COUNTER DRUG PRODUCTS AND PATENTED DRUG PRODUCTS FOR VETERINARY USE

Board Staff reviews the prices of patented over-the-counter drug products or patented veterinary products only when a complaint has been received. No such complaints were received in 2016.

$195 MILLION IN EXCESS REVENUES HAVE BEEN RECOVERED

by the PMPRB through Voluntary Compliance Undertakings and Board Orders since 1993. As at May 31, 2017, as a result of PMPRB investigations, 13 Voluntary Compliance Undertakings were accepted with $36.0 million in excess revenues offset by way of payment to the Government of Canada.

VOLUNTARY COMPLIANCE UNDERTAKINGS AND HEARINGS

VOLUNTARY COMPLIANCE UNDERTAKINGS

A VCU is a written undertaking by a patentee to adjust its price to conform to the Board's Guidelines. Under the Guidelines, patentees are given an opportunity to submit a VCU when Board Staff concludes, following an investigation, that the price of a patented drug product sold in Canada appears to have exceeded the thresholds set out in the Guidelines. A VCU represents a compromise between the PMPRB and the patentee as a result of negotiations between the parties geared towards a satisfactory resolution of an investigation initiated by Board Staff as per the Guidelines. A VCU takes into account the specific facts and underlying context of a particular case. As such, VCUs are not intended to have precedential value. A VCU can also be submitted by a patentee following the issuance of a Notice of Hearing.[2]

In 2016, twelve VCUs were accepted. In addition to price reductions for certain drug products, excess revenues totaling $5,041,226.52 were offset by way of payments to the Government of Canada.

In 2017, as at May 31, 2017, one VCU has been approved by the Chairperson, in the matters of various GlaxoSmithKline Inc. drug products, in which $31,000,000.00 in excess revenues were offset by way of a payment to the Government of Canada.

Patentees are to ensure that the prices of their patented drug products are within the Board's Guidelines during all periods in which the drug products are under the PMPRB's jurisdiction.

Table 5. Voluntary Compliance Undertakings in 2016 up to May 31, 2017

Patented drug product	Therapeutic use	Patentee	Date of approval	Offset of excessive revenues	
				Price reduction	Payment to the government
VCUs in 2016					
Actimmune[1] (1 drug product)	Chronic granulomatous disease and severe, malignant osteoporosis	Horizon Pharma Ireland Limited	May		$590,519.57
Angiomax (1 drug product)	An anticoagulant in patients undergoing percutaneous coronary intervention and in the treatments of patients with moderate to high risk acute coronary syndromes due to unstable angina or non-ST-segment elevation in whom early percutaneous coronary intervention is planned	Sunovion Pharmaceuticals Canada Inc.	March		$88,412.60
Apprilon (1 drug product)	Treatment of only inflammatory lesions (papules and pustules) or rosacea in adult patients	Galderma Canada Inc.	March	✓	
Cialis (4 drug products)	Treatment of erectile dysfunction and/or benign prostatic hyperplasia	Eli Lilly Canada Inc.	May	✓	$3,256,005.27
Fibristal (1 drug product)	Treatment of moderate to severe signs and symptoms of uterine fibroids in adult women of reproductive age, who are eligible for surgery	Allergan Inc.	June		$809,568.89
Mitosol (1 drug sproduct)	Adjunct to ab externo glaucoma surgery	Labtician Ophthalmics Inc.	January		$190.58

continued

Patented drug product	Therapeutic use	Patentee	Date of approval	Offset of excessive revenues	
				Price reduction	Payment to the government
Neoral[2] (1 drug product)	Prevention of graft rejection following solid organ transplantation and treatment of transplant rejection	Novartis Pharmaceuticals Canada Inc.	February	✓	$96,466.51
Oncaspar[3,4] (1 drug product)	A component of a multi-agent chemotherapeutic regimens to treat acute lymphoblastic leukemia	Baxalta Canada Corporation	December	✓	
Pergoveris (1 drug product)	Simulation of follicular development in women with severe LH and FSH deficiency	EMD Inc.	December		$63.10
Samsca (2 drug products)	Treatment of clinically important, nonhypovolemic-hyponatremia	Otsuka Canada Pharmaceutical Inc.	April		$200,000.00
Spiriva Respimat (1 drug product)	An add-on maintenance bronchodilator treatment in adult patients with asthma who are currently treated with the maintenance combination of inhaled corticosteroids (ICS ≥ 800 µg budesonide/day or equivalent) and long-acting β agonists (LABA) and who experienced one or more severe exacerbations in the previous year.	Boehringer Ingelheim (Canada) Ltd	May	✓	
Xalkori (2 drug products)	Monotherapy for use in patients with anaplastic lymphoma kinase (ALK)-positive locally advanced (not amenable to curative therapy) or metastic non-small cell lung cancer.	Pfizer Canada Inc.	June	✓	
Total					**$5,041,226.52**
		VCUs in 2017, up to May 31			
Various brand names	Various drug products for various indications.	GlaxoSmithKline Inc.	March		$31,000,000.00
Overall Total					**$36,041,226.52**

[1] Actimmune is not approved in Canada. It is made available by Horizon Pharma Inc., through one or more subsidiaries and affiliates, (collectively, "Horizon") to Canadian patients under the Health Canada Special Access Programme. In the US, Actimmune is approved for Chornic Granulomatous Disease ("CGD") and severe, malignant osteoporosis ("SMO"). It is currently being studied in Friederich's Ataxia, a rare disease with no treatment.

[2] These drug products were no longer patented in 2015 therefore, they are not included in the number of VCUs reported in Table 4 – Patented Drug Products for Human Use Sold in 2015.

[3] Oncaspar is not approved in Canada. It is made available by Baxalta Canada Corporation to Canadian patients under the Health Canada Special Access Programme. In the US, Oncaspar is approved as a component of multi-agent chemotherapeutic regimens to treat acute lymphoblastic leukemia.

[4] Excess revenues were offset by payments to customers that purchased Oncaspar between July 1, 2015 and June 30, 2016.

HEARINGS

The PMPRB holds hearings into two types of matters:

- excessive pricing; and
- failure to file—jurisdiction.

EXCESSIVE PRICING

In the event that the price of a patented medicine appears to be excessive, the Board can hold a public hearing. If it finds that the price is excessive, it may issue an order to reduce the price of the patented medicine in question (or of another patented medicine of the patentee) and/or to offset revenues received as a result of the excessive price. Judicial review of Board decisions can be sought in the Federal Court of Canada.

In January 2015, the PMPRB announced it would hold a public hearing in the matter of the price of the patented medicine Soliris, and Alexion Pharmaceuticals Inc. (Alexion), the pharmaceutical company that holds the patent for Soliris and sells the medicine in Canada. The purpose of this hearing is to determine whether the medicine has been or is being sold in any market in Canada at a price that, in the Board's opinion, is or was excessive; and, if so, what order, if any, should be made to remedy the excessive pricing. The hearing was held in January, February and April 2017 and the matter is currently under advisement.

Remaining before the Board is the matter of whether Apo-Salvent CFC Free was excessively priced.

FAILURE TO FILE—JURISDICTION

When Board Staff finds a patentee has failed or refused to provide the PMPRB with the pricing and sales information required by law, Board Staff will recommend that the Chairperson call a public hearing to determine whether the patentee is, in fact, bound by the reporting requirements of the Act and Regulations (i.e., under the PMPRB's jurisdiction). If the Board Panel finds, as the result of a public hearing, that the patentee is in breach of its reporting requirements, the Board Panel may order the patentee to provide the PMPRB with the required pricing and sales information.

Following public complaints addressed to Board Staff concerning the price of two drug products, the PMPRB announced in February and March 2016 that it would hold separate public hearings with respect to whether Galderma Canada Inc. (Galderma) and Baxalta Canada Corporation (Baxalta) are required to provide the PMPRB with the pricing and sales information stipulated in the *Patent Act* and the *Patented Medicines Regulations*.

The Hearing Panel in the Galderma proceedings issued an Order on December 19, 2016 relating to the medicines Differin and Differin XP. The Hearing Panel found that one of the three patents at issue in the proceedings pertains to Differin and ordered Galderma to provide PMPRB staff with pricing and sales information required by section 80 of the *Patented Medicines Regulations* with respect to that medicine for the period between January 1, 2010 and March 14, 2016. The Hearing Panel dismissed PMPRB staff's application with respect to the other two patents at issue. Following the Board's decision, Galderma brought an application for judicial review which is currently pending Federal Court.

The Hearing Panel in the Baxalta proceedings issued an Order on October 28, 2016, on consent of the parties, discontinuing the application, following Baxalta's agreement to provide the information sought by Board Staff for the period commencing July 1, 2015, when Baxalta began to sell Oncaspar in Canada.

One Failure to File matter remains before the Board involving Apotex Inc.

(Endnotes)

1 Prior to 2010 the PMPRB categorized new drug products as follows: Category 1 – a new DIN of an existing dosage form of an existing medicine, or a new DIN of another dosage form of the medicine that is comparable to the existing dosage form. Category 2 – is one that provides a breakthrough or substantial improvement. It is a new DIN of a non-comparable dosage form of an existing medicine or the first DIN of a new chemical entity. Category 3 – a new DIN of a non-comparable dosage form of an existing dosage form of an existing medicine, or the first DIN of a new chemical entity. These DINs provide moderate, little or no therapeutic advantage over comparable medicine. This group includes those new drugs that are not included in Category 2. For purposes of this analysis all drugs in Category 2 were included in the Breakthrough category and all Category 1 and 3 drugs were included in the Slight or No Improvement category.

2 Disputes between Patentees and Board Staff regarding matters that are the subject of a hearing may be resolved via settlement. These settlements are rare and the terms of such settlements reflect a compromise by both parties on the issues before the Board in order to avoid the further risk and expense related to continuing the dispute. In 2016, there were two such settlements reached in the context of applications for judicial review before the Federal Court involving the Attorney General of Canada—one with Teva Canada Limited and the other with Sandoz Canada Inc. The terms of the settlements are confidential.

SUMMARY

Excess revenues totaling $36,041,226.52 were offset by way of payments to the Government of Canada through VCUs and Board Orders in 2016 and up to May 31, 2017.

Since 1993, a total of 121 VCUs have been approved and 30 public hearings initiated. These measures resulted in price reductions and the offset of excess revenues by way of additional price reductions and/or payments to the Government of Canada. Over $195 million has been collected through VCUs and Board Orders by way of payments to the Government of Canada and/or to customers such as hospitals and clinics.

MATTERS BEFORE THE FEDERAL COURT, FEDERAL COURT OF APPEAL AND SUPREME COURT OF CANADA

On September 8, 2016, ratiopharm inc. (now Teva Canada Limited) and Sandoz Canada Inc. discontinued their application to the Supreme Court of Canada for leave to appeal the Federal Court of Appeal's November 6, 2015 decision. This decision held that a person who sells a patented medicine pursuant to an express or an implied licence under a patent (or patents) is a "patentee" and subject to the PMPRB's jurisdiction.

On January 18, 2017, Galderma Canada Inc. filed an application for judicial review of the Board's decision dated December 19, 2016 in respect of its finding that Canadian Patent No. 2,478,237 pertains to Differin and ordering Galderma to file the required information for the period between January 1, 2010 and March 14, 2016. The matter is ongoing before the Federal Court.

There were also applications for judicial review before the Federal Court and Federal Court of Appeal in respect of Board decisions made in the context of the Soliris hearing, as detailed in Table 6 below. In particular, on September 11, 2015, Alexion filed an application for judicial review regarding the constitutionality of the Board. The Federal Court granted the Attorney General's motion to strike this application on June 23, 2016. This was further upheld by a Federal Court Order dated December 28, 2016. On February 15, 2017, Alexion appealed this decision to the Federal Court of Appeal. The matter is ongoing.

Table 6. Status of Board Proceedings in 2016 up to May 31, 2017

ALLEGATIONS OF EXCESSIVE PRICING

Patented drug product	Indication/use	Patentee	Issuance of notice of hearing	Status
Apo-Salvent CFC-Free	Asthma	Apotex Inc.	July 8, 2008	Ongoing
Soliris	Paroxysmal nocturnal hemoglobinuria Atypical hemolytic uremic syndrome	Alexion Pharmaceuticals Inc.	January 20, 2015	Board decision pending

ALLEGATIONS OF FAILURE TO FILE

Patented drug product	Indication/use	Patentee	Issuance of notice of hearing	Status
All medicines for which Apotex is a "patentee"		Apotex Inc.	March 3, 2008	Ongoing
Differin **Differin XP** **TactuPump** **TactuPump Forte**	Acne	Galderma Canada Inc.	February 23, 2016	Hearing Panel issued an Order requiring Galderma to file information with respect to the medicine Differin for the period between January 1, 2010 and March 14, 2016. Galderma filed application for judicial review.
Oncaspar	Acute Lymphoblastic Leukemia	Baxalta Canada Corporation	March 22, 2016	Hearing Panel issued an Order on October 28, 2016, on consent of the parties, discontinuing the application

continued

JUDICIAL REVIEW OF BOARD DECISIONS AND APPEALS

Patented drug product	Indication/use	Patentee	Issue	Date of notice of hearing/status
ratio-Salbutamol HFA	Asthma	ratiopharm Inc. (now Teva Canada Limited)	Allegations of excessive pricing	July 18, 2008 Application for leave to appeal at the Supreme Court of Canada discontinued: September 8, 2016
		ratiopharm Inc. (now Teva Canada Limited)	Failure to file (jurisdiction)	August 28, 2008 Application for leave to appeal at the Supreme Court of Canada discontinued: September 8, 2016
		Sandoz Canada Inc.	Failure to file (jurisdiction)	March 8, 2010 Application for leave to appeal at the Supreme Court of Canada discontinued: September 8, 2016
Soliris	Paroxysmal Nocturnal Hemoglobinuria Atypical Hemolytic Uremic Syndrome	Alexion Pharmaceuticals Inc.	Allegations of excessive pricing	January 20, 2015 Court File T-1537-15 Notice of Appeal filed at Federal Court of Appeal: February 15, 2017 (A-51-17) AG's motion to strike granted: June 23, 2016 (2016 FC 716, aff'd 2017 FC 22) Alexion filed application for judicial review: September 11, 2015 Court File T-1855-15 Order staying application: February 10, 2016 Alexion filed application for judicial review of October 5, 2015 Board Decision: November 3, 2015 Court File T-1160-16 Federal Court Order dismissing application: September 2, 2016 (aff'd 2017 FC 21) Alexion filed application for judicial review of June 10, 2016 Board Decision: July 13, 2016 Court File T-110-17 Application for judicial review filed at the Federal Court: January 23, 2017, application abandoned: January 31, 2017
Differin **Differin XP**	Acne	Galderma Canada Inc.	Failure to file (jurisdiction)	February 23, 2016 Court File T-83-17 Application for judicial review filed at the Federal Court: January 18, 2017

KEY PHARMACEUTICAL TRENDS: DRUG SALES ARE ON THE RISE

Overall spending on pharmaceuticals is influenced by many factors, including price, utilization, the market entry of newer, more expensive drugs, and older drugs "going generic". In 2016, sales of patented drugs increased by 2.6% and Canadian prices were fourth highest among the PMPRB's comparator countries (PMPRB7).

The PMPRB is responsible for reporting on trends in pharmaceutical sales and pricing for all medicines and for reporting research and development spending by patentees. In addition, the PMPRB undertakes studies and conducts analysis on a variety of topics related to pharmaceutical pricing and costs.

TRENDS IN SALES OF PATENTED DRUG PRODUCTS

Patentees are required under the *Patented Medicines Regulations* to submit detailed information on their sales of patented drug products, including quantities sold and net revenues received for each product by class of customer in each province/territory. The PMPRB uses this information to analyze trends in sales, prices and utilization of patented drug products.[3] This section provides key statistical results from this analysis.

$15.5 BILLION SALES IN PATENTED DRUG PRODUCTS

In 2016, sales of patented drug products increased to $15.5 billion from $15.1 billion in 2015.

SALES AND PRICES[4]

Canadians spend much more today on patented drug products than they did a decade ago, but it is important to understand that an increase in drug spending does not in itself imply rising drug prices. For example, the PMPRB's Annual Reports from 1995 through 2003 noted that sales of patented drug products grew at annual rates consistently exceeding 10%, while average annual rates of change for prices were less than 1%. In these instances, sales growth was driven by changes in the volume and composition of drug utilization.

A variety of factors can produce such changes. These include:

- increases in total population
- changes in the demographic composition of the population (for example, shifts in the age distribution toward older persons with more health problems)
- increases in the incidence of health problems requiring drug therapy
- changes in the prescribing practices of physicians (for example, a shift away from older, less expensive drug products to newer, more expensive medications, or a shift toward higher, more frequent dosages)
- increases in the use of drug therapy instead of other forms of treatment
- the use of new drug products to treat conditions for which no effective treatment existed previously
- the use of new drug products that enter the market at a higher price than previous treatments for a given condition

SALES TRENDS

Table 7 reports patentees' total sales of patented drug products in Canada for 1990 through 2016. In 2016, sales of patented drug products increased to $15.5 billion from $15.1 billion in 2015, an increase of 2.6%. This is the lowest growth rate since 2012.

The third column of Table 7 gives sales of patented drug products as a share of overall drug sales. This share rose from 43.2% in 1990 to a peak of 72.7% in 2003. It declined over the 2004 to 2010 period, but has been quite stable since. That is, sales of non-patented brand and generic drug products have generally grown at similar rates as the sales of patented drug products in recent years.

The fourth column of Table 7 gives sales of patented drug products per Capita. Patented drug sales per capita rose from $61.6 in 1990 to $428.2 in 2016. The last column gives sales of patented drug products per GDP. Patented drug sales per GDP rose from 0.25 in 1990 to 0.77 in 2016.

DRIVERS OF SALES GROWTH

Table 8 decomposes the sales growth that occurred between 2015 and 2016 into distinct elements reflecting the impacts of:

- previously patented drug products that have gone off-patent or left the Canadian market ("exiting drug effect")
- patented drug products introduced to the Canadian market in 2016 ("new drug effect")
- changes in prices among patented drug products with sales in Canada in both 2015 and 2016 ("price effect")
- differences in the quantities of such drug products sold in the two years ("volume effect")
- interactions of price and quantity changes ("cross effect")

The first row of Table 8 gives these impacts as dollar amounts. The second row expresses the impacts as proportions of the overall change in sales between 2015 and 2016. For the sake of comparison, the third row provides average year-over-year proportionate impacts for 2011 through 2015.[5]

The results in this table show that the increase in total sales that occurred between 2016 and 2015 was the result of two factors: increases in the quantity of existing drug products sold, and strong sales for new drugs, which offset a relatively large exiting drug effect. Proportionally, the 2016/2015 decomposition values are nearly identical to those in 2015/2014.

Table 7. Sales of Patented Drug Products, 1990–2016

Year	Patented drug products		Sales of patented drug products as a share of all drug sales (%)*	Patented drug sales per Capita	Change (%)	Patented drug sales per GDP (%)
	Sales ($billions)	Change (%)				
2016	15.5	2.6	60.8	$428.2	1.5	0.765
2015	15.1	9.4	61.6	$421.8	8.5	0.760
2014	13.8	3.1	59.9	$388.7	1.8	0.696
2013	13.4	4.2	60.7	$381.8	2.7	0.706
2012	12.9	0.1	59.2	$371.8	-1.2	0.708
2011	12.9	3.5	58.3	$376.1	3.1	0.729
2010	12.4	-4.3	55.8	$364.7	-5.7	0.746
2009	13.0	2.9	59.6	$386.9	1.9	0.829
2008	12.6	4.6	61.7	$379.5	2.9	0.762
2007	12.1	3.2	63.2	$368.9	2.5	0.769
2006	11.7	7.4	67.8	$360.0	6.3	0.784
2005	10.9	4.2	70.6	$338.5	2.8	0.769
2004	10.5	7.8	72.2	$329.2	7.2	0.789
2003	9.7	9.0	72.7	$307.0	8.0	0.776
2002	8.9	17.5	67.4	$284.3	16.0	0.748
2001	7.6	18.9	65.0	$245.2	19.1	0.666
2000	6.3	16.7	63.0	$205.9	15.9	0.571
1999	5.4	27.0	61.0	$177.6	24.3	0.538
1998	4.3	18.9	55.1	$142.9	15.4	0.459
1997	3.7	22.6	52.3	$123.7	22.1	0.409
1996	3.0	12.8	45.0	$101.4	14.2	0.350
1995	2.6	10.8	43.9	$88.7	7.2	0.314
1994	2.4	-2.1	40.7	$82.8	-1.4	0.304
1993	2.4	9.4	44.4	$83.9	7.9	0.322
1992	2.2	14.0	43.8	$77.7	8.8	0.307
1991	2.0	13.1	43.2	$71.4	16.0	0.286
1990	1.7	—	43.2	$61.6	—	0.245

** The denominator in this ratio comprises sales of patented, non-patented brand and generic drug products. Starting with the estimate for 2005, this value is derived from data contained in IMS Health's MIDAS™ database. In previous years, IMS data were used to calculate sales of generic drug products only, while sales of non-patented brand products were estimated from data submitted by patentees. This approach was abandoned because of anomalies related to year-to-year changes in the set of companies reporting to the PMPRB. Ratios reported for years before 2005 likely overstate the patented share, but by only a small amount. This small bias in no way invalidates the strong upward trend evinced by the results for the years 1990 through 2003. Ratios since 2009 have also been revised slightly as a result of data updates from IMS Health—none of these adjustments resulted in a change greater than 0.4%.*

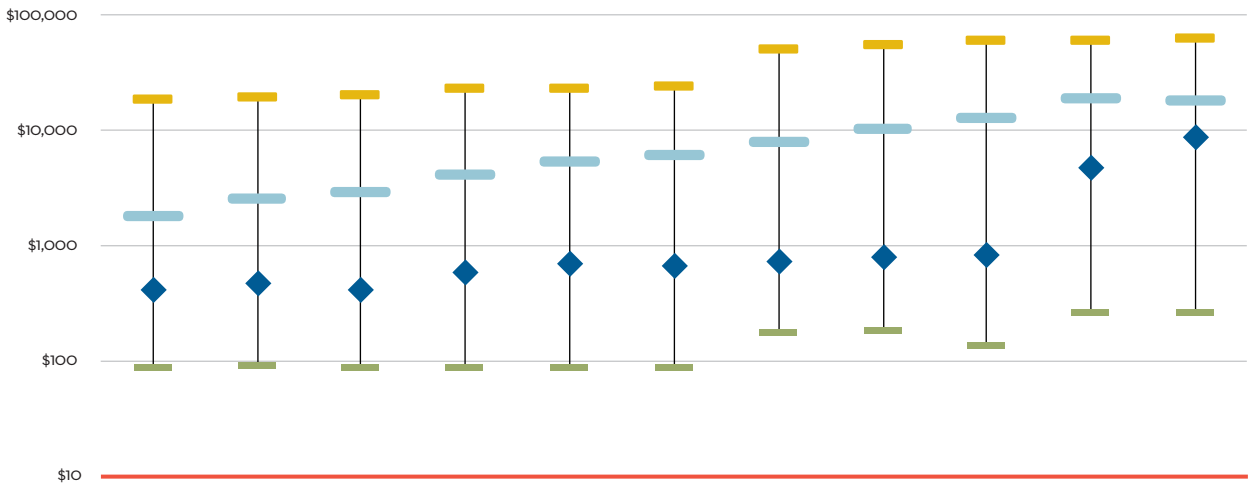
Sources: PMPRB; MIDAS™ database, 2005-2016, IMS AG. All rights reserved[6]

Table 8. Decomposition of Changes in Sales of Patented Drug Products

	Total change	Exiting drug effect	New drug effect	Price effect	Volume effect	Cross effect
Sales impact, 2016/2015 ($millions)	423.90	-385.43	296.17	-113.94	751.82	-124.71
Proportion of total change, 2016/2015 (%)	100.00	-90.93	69.87	-26.88	177.36	-29.42
Average proportion of total change, 2011–2015 (%)	100.00†	-213.00	247.25	32.90	56.21	-23.35

† Value may not add due to rounding.
Source: PMPRB

Figure 3. Treatment Cost for Top 20 Selling Patented Drugs, 2006 to 2016



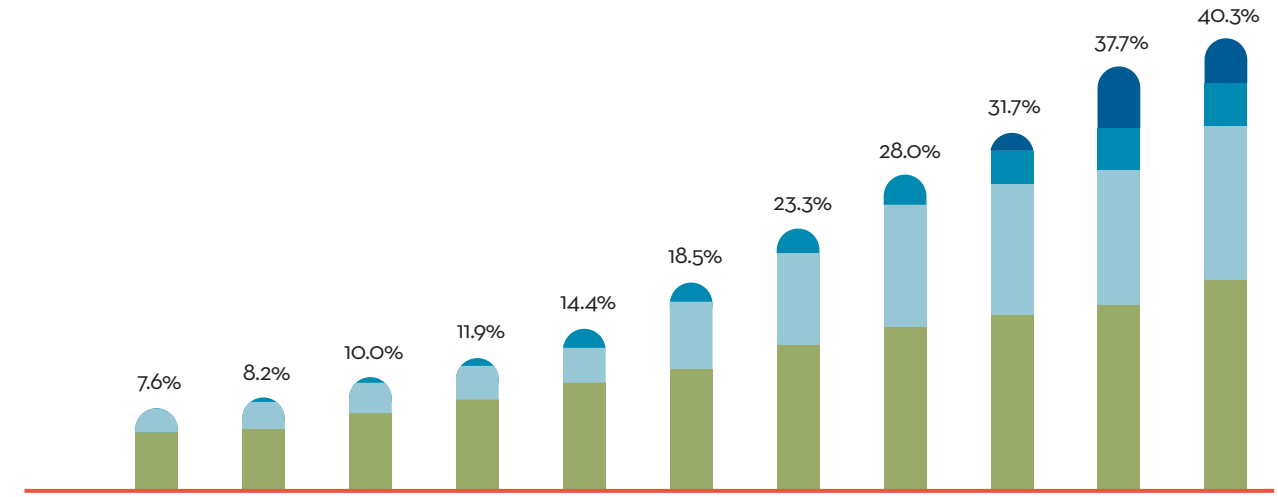
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Weighted Avg.	$1,797	$2,576	$2,892	$4,114	$5,228	$6,009	$7,960	$10,156	$12,491	$18,830	$17,770
Median	$409	$479	$420	$584	$704	$675	$731	$803	$828	$4,626	$8,584
Max	$17,759	$18,669	$19,974	$22,716	$22,362	$23,507	$49,022	$52,227	$58,800	$58,830	$60,249
Min	$86	$89	$86	$88	$88	$87	$173	$181	$136	$254	$260

Source: PMPRB & QuintilesIMS, Private Drug Plan Direct Drug Plan Database, 2006–2016

Over the last decade there has been a significant shift in pharmaceutical development toward more specialized drugs, with an increasing number of higher-cost drugs compounded by a notable uptake in their use. As illustrated in Figure 3, for many years, the majority of the top 20 selling patented drugs had annual treatment costs in hundreds of dollars; however, the last two years marked a turning point, as most of the top 20 selling patented drugs now cost thousands or tens of thousands of dollars. This shifting trend is reflected in the exceptional tenfold growth in the median annual treatment cost of these drugs, which reached $8,584 in 2016. In addition to their higher cost, these drugs have had a remarkable uptake in utilization, elevating the weighted average annual treatment cost for the top 20 selling patented drugs to $17,770. While a decade ago this level marked the maximum average annual treatment cost, in 2016, the new maximum was $60,249.

Between 2006 and 2016 the number of medicines in Canada with an annual per beneficiary cost of at least $10,000 increased by over 200% and now account for 40% of patented drug sales as compared to 7.6% in 2006.

Figure 4. Revenue Share of High-Cost Patented Drugs, 2006 to 2016



HIGH COST DRUGS (HCD)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Drug Cost ($M)	$967M	$1,090M	$1,372M	$1,701M	$1,982M	$2,518M	$3,105M	$3,843M	$4,503M	$5,746M	$6,314M
Total no. of molecules	44	53	61	67	74	93	97	108	116	126	135
10 to 20k	27	32	33	36	38	49	48	53	53	54	55
20k to 50k	11	12	17	19	21	27	31	37	41	46	55
50k+	6	9	11	12	15	17	18	17	19	21	19
DAA drugs for Hepatitis C	0	0	0	0	0	0	0	1	3	5	6
Avg. treatment cost per beneficiary	$15,111	$15,631	$15,507	$15,755	$16,247	$17,071	$17,621	$18,084	$18,964	$20,660	$20,106
Estimated number of beneficiaries	64,007	69,708	88,506	107,978	122,009	147,533	176,224	212,509	237,461	278,117	314,042
Share of population	0.20%	0.21%	0.27%	0.32%	0.36%	0.43%	0.51%	0.60%	0.67%	0.77%	0.86%

Numbers may not add due to rounding

Source: PMPRB & QuintilesIMS, Private Drug Plan Direct Drug Plan Database, 2006-2016

Figure 4 shows that high-cost drugs represent an increasingly significant share of the total cost of the patented drug market, rising steeply from 7.6% in 2006 to a remarkable 40.3% in 2016. This sustained growth was evident in all cost bands (10k to 20K; 20K to 50K and 50K+), with the steepest increase in the highest-cost drugs. While the new direct-acting antiviral drugs for hepatitis C were a major contributor to the growth in high-cost drugs, other high-cost drugs played an even more pronounced role. Despite the sharp increase in the share of costs, the number of patients benefiting from these drugs remained at less than 1% of the population.

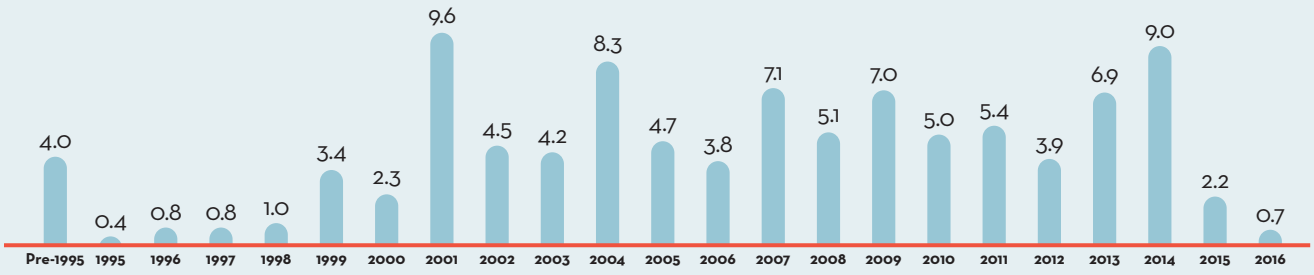
Figure 5 breaks down 2016 sales of patented drug products according to the year in which the product was first sold in Canada. Throughout the latter part of the 1990s and early 2000s, sales growth was largely driven by a succession of new "blockbuster" products that ultimately achieved very high sales volumes. Despite the recent patent expiries ("patent cliff"), these products still accounted for a considerable share of patented drug sales in 2016. Most significant, however, was the introduction of several highly effective treatments for Hepatitis C in 2014, which has significantly increased the share of sales attributable to drugs released in that year.

SALES BY THERAPEUTIC CLASS

The PMPRB classifies drug products according to the World Health Organization's (WHO) Anatomical Therapeutic Chemical (ATC) system when it conducts analyses. This is a scientific, hierarchical system that classifies drug products according to their principal therapeutic use and chemical composition. At its first level of aggregation (Level 1), the ATC system classifies drug products according to the element of human anatomy with which they are primarily associated.

Table 9 breaks out sales of patented drug products in Canada in 2016 by ATC Level 1. The table gives the 2016 sales for each class, the share of the total sales this represents and the rate at which sales grew relative to 2015. Values in the last column represent the component of overall sales growth attributable to drug products in the corresponding therapeutic class.[7] By this measure, antineoplastics and immunomodulating agents and alimentary tract and metabolism made the largest contribution to sales growth. Lower sales of both general antiinfectives for systemic use and antiparasitic products, and genito-urinary system and sex hormones drugs also had a significant impact on overall expenditure.

Figure 5. Share of 2016 (%) Sales of Patented Drug Products by Year of Introduction



Source: PMPRB

Table 9. Sales of Patented Drug Products by Major Therapeutic Class, 2016

Therapeutic class	2016 sales ($millions)	Share: 2016 sales (%)	Growth: 2016/2015 ($millions)	Growth: 2016/2015 (%)	Impact on change in expenditure (%)
A: Alimentary tract and metabolism	1,717.5	11.1	118.2	7.4	28.9
B: Blood and blood forming organs	883.1	5.7	117.7	15.4	28.8
C: Cardiovascular system	830.4	5.4	20.7	2.6	5.1
D: Dermatologicals	125.2	0.8	7.4	6.2	1.8
G: Genito-urinary system and sex hormones	403.9	2.6	-132.7	-24.7	-32.5
H: Systemic hormonal preparations	70.9	0.5	8.4	13.4	2.0
J: General antiinfectives for systemic use and P: Antiparasitic products*	2,232.7	14.4	-202.1	-8.3	-49.5
L: Antineoplastics and immunomodulating agents	5,143.2	33.2	484.9	10.4	118.6
M: Musculo-skeletal system	396.5	2.6	34.8	9.6	8.5
N: Nervous system	1,552.8	10.0	-78.6	-4.8	-19.2

continued

Therapeutic class	2016 sales ($millions)	Share: 2016 sales (%)	Growth: 2016/2015 ($millions)	Growth: 2016/2015 (%)	Impact on change in expenditure (%)
R: Respiratory system	1,245.2	8.0	8.9	0.7	2.2
S: Sensory organs	798.7	5.2	7.1	0.9	1.7
V: Various	95.9	0.6	14.1	17.2	3.4
All therapeutic classes†	**15,496.0**	**100.0**	**408.8**	**2.6**	**100.0**

† Values in this row may not add due to rounding.
* These groups have been combined for reasons of confidentiality.

Source: PMPRB

Table 10. Treatment Cost for Top 10 Selling Patented Drugs, 2006 to 2016

2006		2011		2016	
Chemical/Brand	**Annual cost/ beneficiary**	**Chemical/Brand**	**Annual cost/ beneficiary**	**Chemical/Brand**	**Annual cost/ beneficiary**
1. Atorvastatin Calcium (Lipitor)	$511	**1. Rosuvastatin Calcium (Crestor)**	$408	**1. Infliximab (Remicade)**	$28,446
2. Amlodipine Besylate (Norvasc)	$417	**2. Infliximab (Remicade)**	$23,507	**2. Adalimumab (Humira)**	$15,843
3. Ramipril (Altace)	$271	**3. Salmeterol Xinafoate/ Fluticasone Propionate (Advair)**	$414	**3. Ledipasvir/Sofosbuvir (Harvoni)**	$44,333
4. Venlafaxine Hydrochloride (Effexor)	$446	**4. Adalimumab (Humira)**	$14,025	**4. Ranibizumab (Lucentis)**	$8,643
5. Pantoprazole Sodium (Pantoloc)	$330	**5. Clopidogrel Bisulfate (Plavix)**	$683	**5. Etanercept (Enbrel)**	$13,633
6. Clopidogrel Bisulfate (Plavix)	$607	**6. Etanercept (Enbrel)**	$13,226	**6. Salmeterol Xinafoate/ Fluticasone Propionate (Advair)**	$451
7. Rosuvastatin Calcium (Crestor)	$341	**7. Esomeprazole (Nexium)**	$441	**7. Lenalidomide (Revlimid)**	$60,249
8. Olanzapine (Zyprexa)	$977	**8. Ranibizumab (Lucentis)**	$6,740	**8. Immune Globulin Intravenous (Human) (Gammagard)**	$5,546
9. Salmeterol Xinafoate/ Fluticasone Propionate (Advair)	$343	**9. Oxycodone Hydrochloride (Oxycontin)**	$767	**9. Insulin Glargine (Lantus)**	$767
10. Infliximab (Remicade)	$17,759	**10. Immune Globulin Intravenous (Human) (Gammagard)**	$4,651	**10. Aflibercept (Eylea)**	$8,525

yellow = Biologics with an annual treatment cost < $10K
blue = Biologics with an annual treatment cost > $10K

Source: PMPRB & QuintilesIMS, Private Drug Plan Direct Drug Plan Database, 2006-2016

As shown in Table 10, high-cost drugs represent an increasingly significant share of the total cost of the patented drug market, rising steeply from 7.6% in 2006 to a remarkable 40.3% in 2016. This sustained growth was evident in all cost bands (10K to 20K; 20K to 50K and 50K+), with the steepest increase in the highest-cost drugs. While the new direct-acting antiviral drugs for hepatitis C were a major contributor to the growth in high-cost drugs, other high-cost drugs played an even more pronounced role. Despite the sharp increase in the share of costs, the number of patients benefiting from these drugs remained at less than 1% of the population.

In 2016, half of the 10 top-selling drugs had annual treatment costs exceeding $10K.

(Endnotes)

3 All statistical results for patented drug products reported in this chapter are based on data submitted by patentees as of March 2017. On occasion, patentees report revisions to previously submitted data or provide data not previously submitted. New data of this sort can appreciably affect the statistics in this chapter. To account for this possibility, the PMPRB has adopted the practice of reporting recalculated sales figures (see *Trends in Sales of Patented Drug Products*), price and quantity indices (see *Price Trends* and *Utilization of Patented Drug Products*) and foreign-to-Canadian price ratios (see *Comparison of Canadian Prices to Foreign Prices*) for the five years preceding the current Annual Report year. All such recalculated values reflect currently available data. Consequently, where data revisions have occurred, values reported here may differ from those presented in earlier Annual Reports.

4 Sales and price information does not take into account indirect discounts provided to third party payers, such as product listing agreements.

5 Under the scheme applied here, the "exiting drug effect" is the amount of 2016 sales generated by drug products that were under the PMPRB's jurisdiction in 2015 but not in 2016. The "new drug effect" is the amount of 2016 sales generated by drug products that were under the PMPRB's jurisdiction in 2016 but not in 2015. Other effects are derived by means of the relationship:

$$\Sigma\, p^{2016}(i)\, q^{2016}(i) - \Sigma\, p^{2015}(i)\, q^{2015}(i) = \Sigma\, [p^{2016}(i) - p^{2015}(i)]q^{2015}(i) + \Sigma\, p^{2015}(i)\, [q^{2016}(i) - q^{2015}(i)] + \Sigma\, [p^{2016}(i) - p^{2015}(i)]\, [q^{2016}(i) - q^{2015}(i)]$$

$p^y(i)$ is the price of drug i in year y, $q^y(i)$ is the physical volume of drug i sold in year y and Σ signifies summation over the set of drug products that were under the PMPRB's jurisdiction in both 2015 and 2016. The left-hand side of this equation represents the change in total sales of such products between 2015 and 2016. The three terms of the right-hand side define the volume, price and cross effects, respectively, reported in Table 8.

6 Although based in part on data obtained under license from the IMS AG MIDAS™ database, the statements, findings, conclusions, views and opinions expressed in this Annual Report are exclusively those of the PMPRB and are not attributable to IMS AG.

7 This is obtained as the ratio of the year-over-year change in the dollar value of sales for the therapeutic class in question to the change in sales across all patented drug products.

PRICE TRENDS

The PMPRB uses the Patented Medicines Price Index (PMPI) to monitor trends in prices of patented drug products. The PMPI measures the average year-over-year change in the ex-factory prices of patented drug products sold in Canada. The index is constructed using a formula that takes a sales-weighted average of price changes observed at the level of individual drug products.[8] This is similar to the approach Statistics Canada uses to construct the Consumer Price Index (CPI). The PMPI is based on an average transaction price and sales information for a six-month period submitted by patentees.

PATENTED DRUG PRICES INCREASED LESS THAN CPI

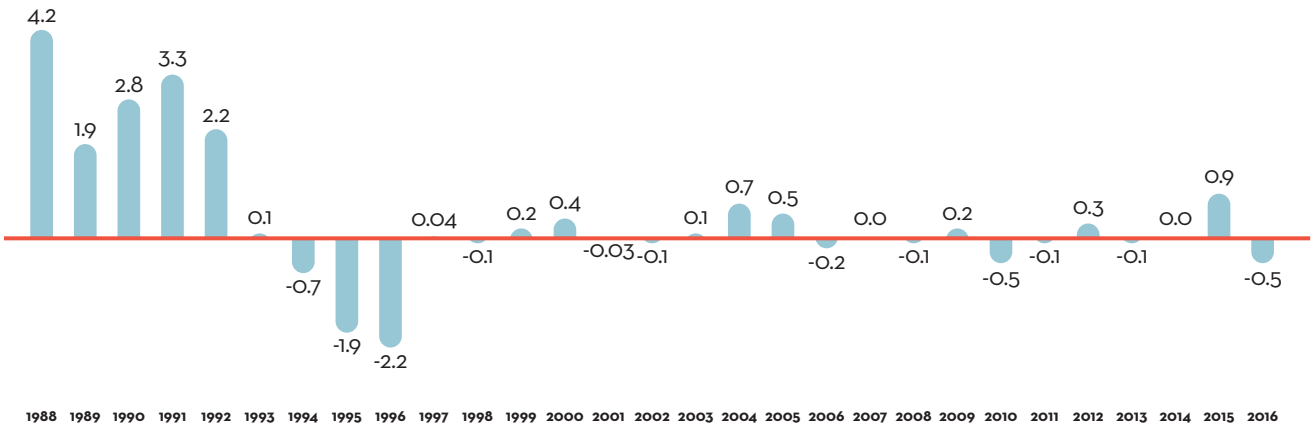
In 2016, the increase in patented drug prices was, on average, less than the rate of inflation, as measured by the Consumer Price Index (CPI), and therefore, did not contribute to sales growth.

It is important to understand the conceptual relationship between the PMPI and drug costs. The PMPI does not measure changes in the utilization of patented drug products; a quantity index, the PMQI, is calculated for this purpose (see *Utilization of Patented Drug Products*). The PMPI does not measure the cost impact of changes in prescribing patterns or the introduction of new medicines. By design, the PMPI isolates the component of sales growth attributable to changes in prices.

Figure 6 provides year-over-year changes in the PMPI for the years 1988 through 2016. As measured by the PMPI, prices of patented drug products decreased from 0.9 in 2015 to -0.5 in 2016.

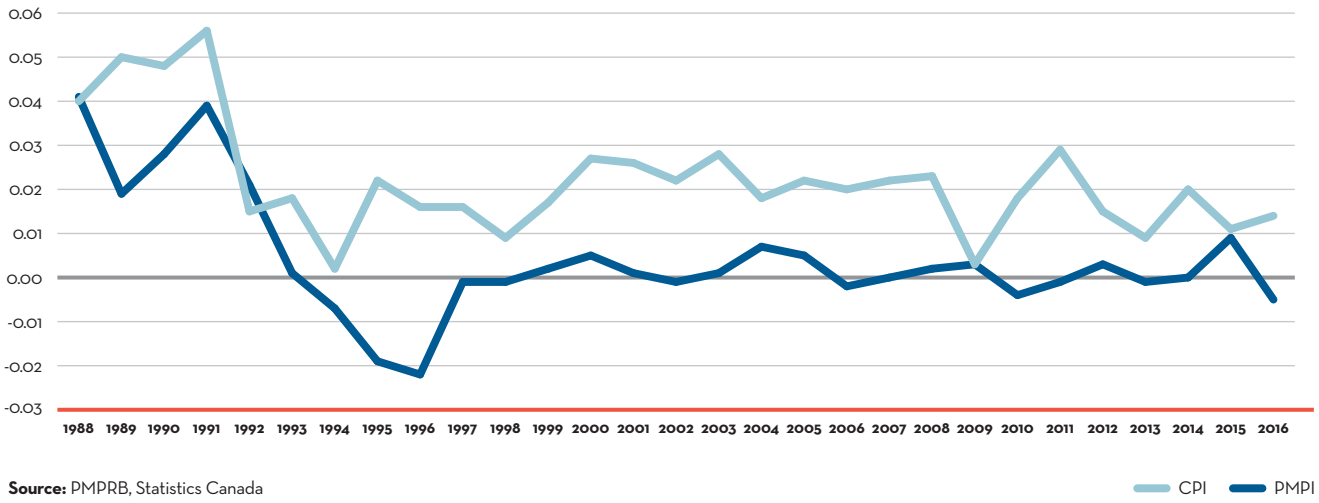
The *Patent Act* requires the PMPRB to consider changes in the CPI, among other factors, in determining whether the price of a patented drug product is excessive. Figure 7 plots year-over-year rates of change in the PMPI against corresponding changes in the CPI. General price inflation, as measured by the CPI, has exceeded the average increase in patented drug prices almost every year since 1988. In 2016, the CPI rose by 1.4%, while the PMPI decreased by -0.5% between 2015 and 2016.

Figure 6. Annual Rates of Change (%), Patented Medicines Price Index (PMPI), 1988–2016



Source: PMPRB

Figure 7. Annual Rate of Change, Patented Medicines Price Index (PMPI) and Consumer Price Index (CPI), 1988–2016



Source: PMPRB, Statistics Canada

It is not surprising that the PMPI has seldom kept pace with the CPI. The PMPRB's Guidelines allow the price of a patented drug product to rise by no more than the CPI over any three-year period. (The Guidelines also impose a cap on year-over-year price increases equal to one and one-half times the current year rate of CPI inflation.) This effectively establishes CPI inflation as an upper bound on the amount by which individual prices may rise over any three-year period.[9] Increases in the PMPI normally do not reach this upper bound because many patentees do not raise their prices by the full amount permitted under the Guidelines.

PRICE CHANGE BY THERAPEUTIC CLASS

Table 11 provides average rates of price change among patented drug products at the level of major therapeutic classes. Results in this table were obtained by applying the PMPI methodology to data segregated by their ATC Level 1 class. The last column provides a decomposition of overall PMPI change, with each entry representing the component of the overall change attributable to drug products in the corresponding therapeutic class. By this measure, the PMPI (-0.5%) reflects a general state of price stability across therapeutic classes. Note that all of the therapeutic classes saw an average rate of price change below the rate of CPI inflation.[10]

Table 11. Change in the Patented Medicines Price Index (PMPI), by Major Therapeutic Class, 2016

Therapeutic class	Share: 2016 Sales (%)	Price change: 2015 to 2016 (%)	Contribution: change in PMPI (%)
A: Alimentary tract and metabolism	11.1	-1.30	-0.14
B: Blood and blood forming organs	5.7	-0.91	-0.05
C: Cardiovascular system	5.4	0.36	0.02
D: Dermatologicals	0.8	0.83	0.01
G: Genito-urinary system and sex hormones	2.6	-3.46	-0.09
H: Systemic hormonal preparations	0.5	0.95	0.00
J: General antiinfectives for systemic use and P: Antiparasitic products*	14.4	0.49	0.07
L: Antineoplastics and immunomodulating agents	33.2	-2.09	-0.70
M: Musculo-skeletal system	2.6	0.27	0.01
N: Nervous system	10.0	0.46	0.05
R: Respiratory system	8.0	-1.61	-0.13
S: Sensory organs	5.2	0.39	0.02
V: Various	0.6	-1.30	-0.01
All therapeutic classes	**100.0†**	**-0.5007**	**-0.5007**

† Values in this column may not add to 100.0 due to rounding.
* These groups have been combined for reasons of confidentiality.

Source: PMPRB

PRICE CHANGE BY CLASS OF CUSTOMER

Figure 8 presents average rates of price change by class of customer.[11] These results were obtained by applying the PMPI methodology separately to sales data for hospital, pharmacy and wholesale customers.[12] The 2016 rates of price change for these classes were, respectively, -4.7%, 4.3% and -0.3%.

PRICE CHANGE BY PROVINCE/TERRITORY

Figure 9 presents average annual rates of price change by province/territory, obtained by applying the PMPI methodology to sales data segregated by the province/territory in which the sale occurred. These results indicate that, between 2015 and 2016, the average transaction prices of patented drug products in Quebec and Ontario fell in wholesale and hospital customer classes.

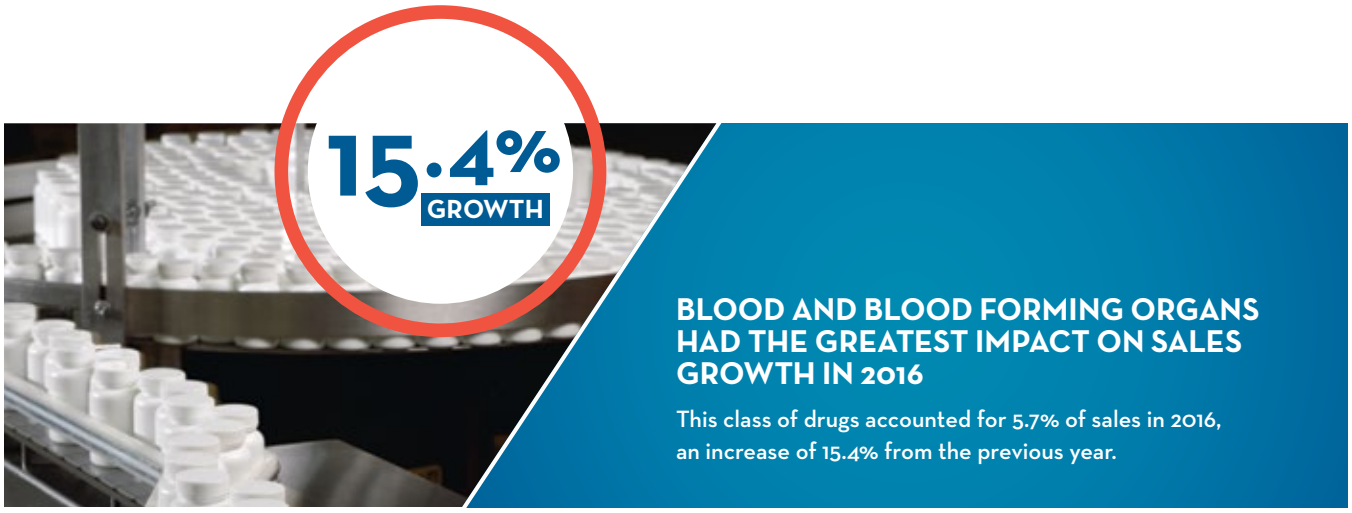
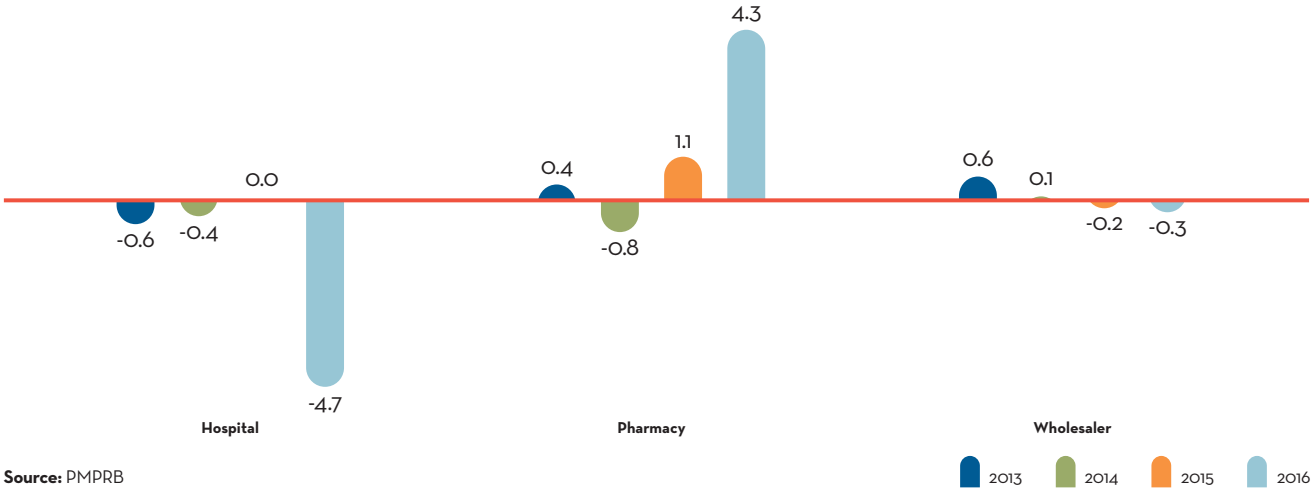
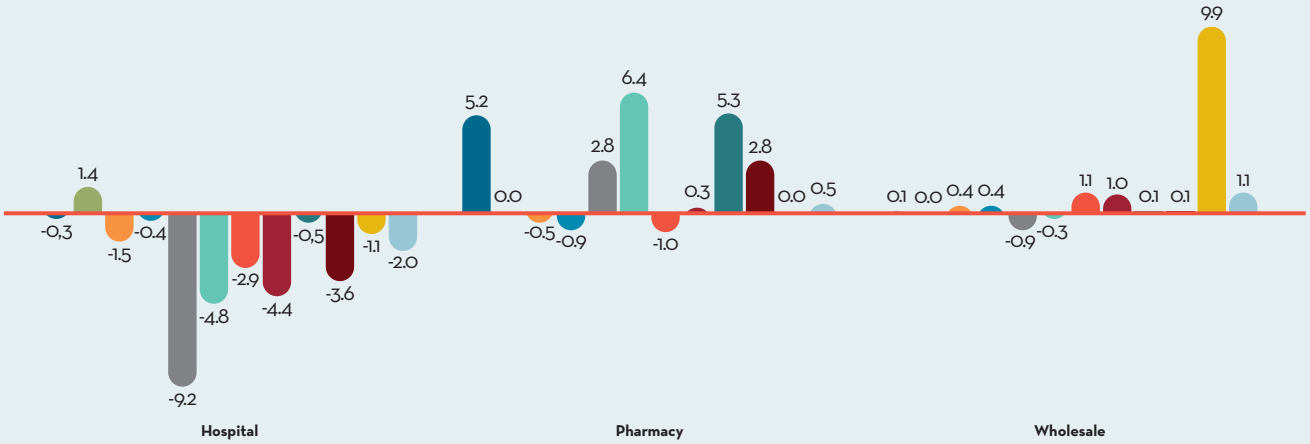


Figure 8. Annual Rate of Change (%), Patented Medicines Price Index (PMPI), by Class of Customer, 2013-2016



Source: PMPRB

Figure 9. Annual Rate of Price Change, by Province/Territory* and Class of Customer, 2016



*Values for Nunavut are included in the Northwest Territories (NWT).

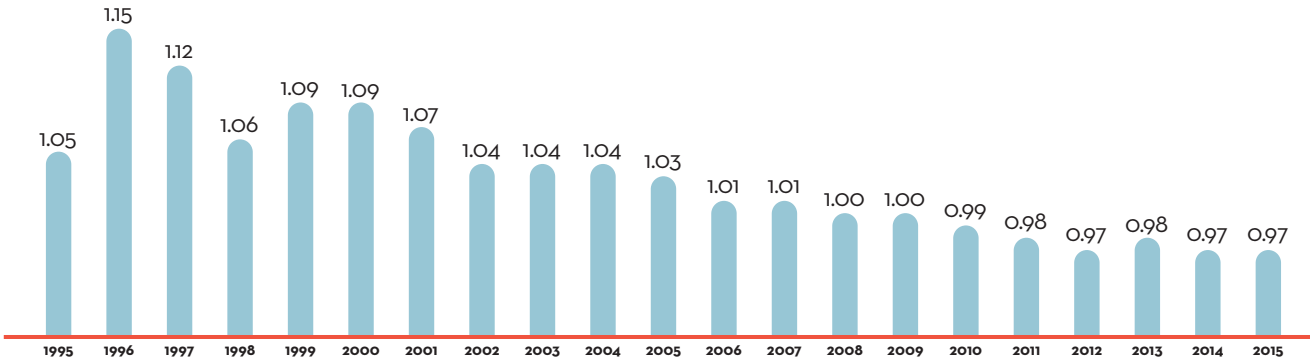
Source: PMPRB

PRICE BEHAVIOUR AFTER INTRODUCTION

Does the price of a typical patented drug product change much in the years after it enters the Canadian market? To answer this question, Figure 10 provides the average ratio of the 2016 price to introductory price (the price at which the drug product was sold in its first year on the Canadian market).

The results in Figure 10 imply a consistent trend for prices to remain stable early in the life cycle, and then to gradually rise by a small amount, year-over-year, afterwards. This is consistent with the effect of the PMPRB's CPI methodology.[13] For example; the prices of products introduced a decade ago are only 3% higher in 2016.

Figure 10. Average Ratio of 2016 Price to Introductory Price, by Year of Introduction



Source: PMPRB

PRICE CHANGE BY COUNTRY

In accordance with the Act and the Regulations, patentees must report publicly available prices of patented drug products for seven foreign comparator countries ("PMPRB7"): France, Germany, Italy, Sweden, Switzerland, the United Kingdom and the United States.

The PMPRB uses this information to:

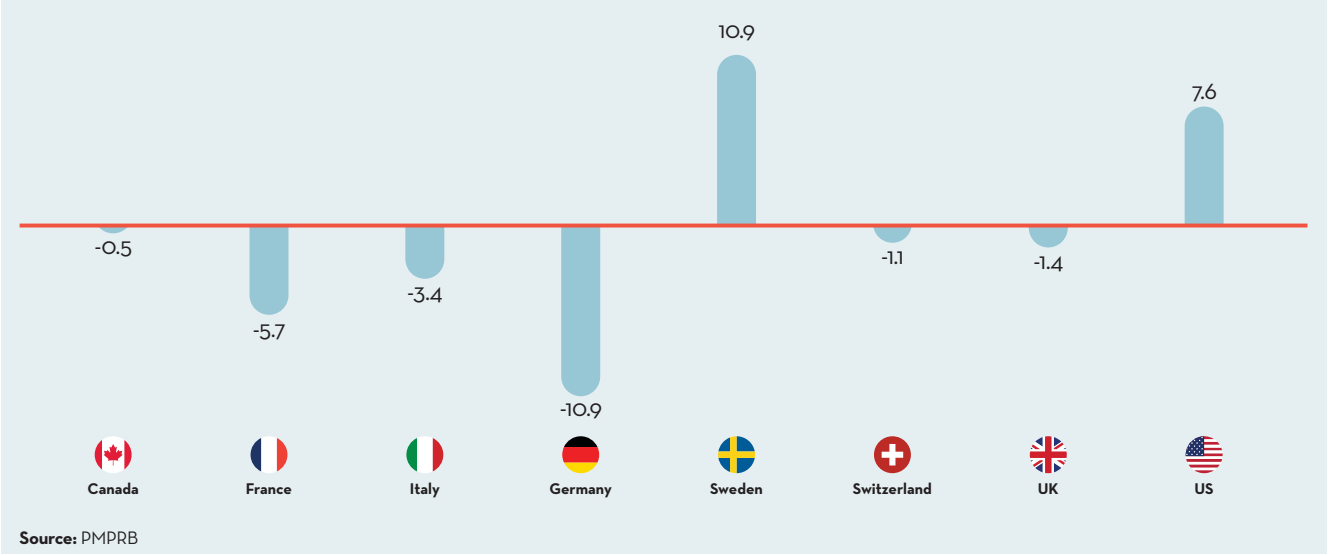
- conduct international price comparison tests (as specified in its Guidelines)
- compare the Canadian prices of patented drug products to those prevailing in other countries

Figure 11 gives the average annual rates of price change for Canada and each of the seven comparator countries. These results were obtained by applying the PMPI methodology (with weights based on Canadian sales patterns) to the international price data that patentees have submitted to the PMPRB. Note that results for the United States are based on prices that incorporate prices from the US Federal Supply Schedule (FSS).[14]

The results in Figure 11 indicate that in 2016, the United States saw prices rise at an average rate of 7.6%. While prices in France, Italy, Switzerland, United Kingdom and Germany declined. These results are consistent with a long-term tendency for patented medicine prices to slowly fall over time in most comparable countries (the exception being the United States).

The foreign market results are based on publicly available ex-factory price information (generally for the retail customer class) submitted by patentees to the PMPRB. The Canadian rate of change, however, is based on the actual average transaction prices and is net of rebates and discounts provided by manufacturers to their direct customers.

Figure 11. Annual Average Rates of Price Change, Canada and Comparator Countries, 2016



Source: PMPRB

(Endnotes)

8 These calculations are performed at the level defined by Health Canada's Drug Identification Number (DIN). Each DIN represents a unique combination of active ingredient(s), dosage form, strength(s), brand and manufacturer.

9 It is possible for individual prices (or, for that matter, the PMPI) to rise by more than the CPI in a given year. This can occur when patentees have banked price adjustments in the preceding years. It can also occur when the forecast rate of CPI inflation exceeds the actual rate.

10 Suppose R represents the overall rate of change in the PMPI and there are N therapeutic classes, indexed by 1, 2 ... N. Let $R(i)$ represent the average rate of price change in major therapeutic class i obtained by means of the PMPI methodology. Using the fact that R is a sales-weighted average of price changes taken over all patented drug products, it is easy to derive the following relationship:

$$R = w(1) \times R(1) + w(2) \times R(2) + \ldots + w(N) \times R(N)$$

where $w(i)$ represents the share of therapeutic class i in the sales of patented drug products. This relationship provides the basis for the decomposition in the last column of Table 11. Each term on its right-hand-side multiplies the average rate of price change for a given therapeutic class by its share of overall sales. The resulting value is readily interpreted as the contribution of the corresponding class to the change in the overall PMPI. Note that the size of this contribution depends on both the rate of price change specific to the class and its relative importance, as measured by its share of sales.

The decomposition in Table 11 is approximate. This is because the weights used to calculate the contribution of each therapeutic class are based on annual sales data, whereas rates of price change (whether overall or by therapeutic class) are calculated from data covering six-month reporting periods. The resulting discrepancy is normally small.

11 Sales of patented drug products are dominated by sales to wholesalers, which accounted for 79.3% of all sales in 2016. Sales to hospitals accounted for another 6.9%, while direct sales to pharmacies accounted for 6.5%. The pharmacy share has fallen precipitously since 2001, when it stood at 20.1%.

12 Results for a fourth class of customer, "Others", are not provided. This class accounted for about 7.3% of patented drug sales in 2016. Buyers in this class are principally health care institutions other than hospitals, such as clinics and nursing homes. It also includes direct sales to governments. The composition of this class is thought to vary substantially from one year to the next, rendering any analysis of price change in this class of limited value.

13 It must be emphasized that this statement refers to the behaviour of prices on average. There may be instances where individual prices have risen or fallen substantially since introduction.

14 The pharmaceutical industry in the US has argued that the publicly available prices in that country do not reflect actual prices because of confidential discounts and rebates. Effective January 2000, and following public consultation, the PMPRB began including prices listed in the US Federal Supply Schedule (FSS) in calculating the average US price of patented drug products. The FSS prices are negotiated between manufacturers and the US Department of Veterans' Affairs. They are typically less than other publicly available US prices reported to the PMPRB by patentees.

COMPARISON OF CANADIAN PRICES TO FOREIGN PRICES

Tables 12 and 13 provide detailed statistics comparing the foreign prices of patented drug products to their Canadian prices. Each table provides two sets of average price ratios. These are differentiated according to the method by which foreign prices were converted to their Canadian dollar equivalents. The tables also give the numbers of drug products (DINs) and the volume of sales encompassed by each reported price ratio.[15]

The average price ratios given in Tables 12 and 13 are sales-weighted arithmetic means of price ratios obtained for individual drug products, with weights based on Canadian sales patterns. Average price ratios constructed in this way provide exact answers to questions of the following type:

How much more/less would Canadians have paid for the patented drug products they purchased in 2016 had they paid Country X prices rather than Canadian prices?

For example, Table 12 states that the 2016 average France-to-Canada price ratio was 0.77. This means Canadians would have paid 23% less for the patented drug products they purchased in 2016 had they bought these products at French prices.

For many years, the PMPRB has reported average foreign-to-Canadian price ratios with foreign prices converted to their Canadian dollar equivalents by means of market exchange rates. (More exactly, the 36-month moving averages of market rates the PMPRB normally uses in applying its Guidelines.) Table 12 also reports foreign-to-Canadian price ratios with currency conversion at purchasing power parity (PPP). The PPP between any two countries measures their relative costs of living expressed in units of their own currencies. In practice, cost of living is determined by pricing out a standard "basket" of goods and services at the prices prevailing in each country.

Because PPPs are designed to represent relative costs of living, they offer a simple way to account for differences in overall national price levels when comparing individual prices, incomes and other monetary values across countries. When applied to the calculation of average foreign-to-Canadian price ratios they produce statistics answering questions of this type:

How much more/less consumption of other goods and services would Canadians have sacrificed for the patented drug products they purchased in 2016 had they lived in Country X?

Questions of this type cannot be answered by simply comparing drug prices. Rather, one must first calculate what each price represents in terms of goods and services foregone. PPPs are designed for such purposes.

Table 12. Average Foreign-to-Canadian Price Ratios, Bilateral Comparisons, 2016

	Canada	France	Italy	Germany	Sweden	Switzerland	United Kingdom	United States
At Market Exchange Rates								
Average price ratio 2016	1.00	0.77	0.92	1.09	0.95	1.09	0.99	3.08
Average price ratio 2015	1.00	0.75	0.87	1.16	0.94	1.00	0.92	2.70
At Purchasing Power Parities								
Average price ratio 2016	1.00	0.83	1.09	1.22	0.84	0.87	0.97	3.15
Average price ratio 2015	1.00	0.80	0.97	1.27	0.81	0.79	0.92	2.95
Number of patented drug products 2016	1,419	742	888	1,011	853	887	973	1,119
Sales ($millions)	15,496.01	9,399.96	12,528.09	13,381.66	12,163.97	12,961.69	13,141.21	14,228.95

Source: PMPRB

BILATERAL COMPARISONS

Table 12 provides bilateral comparisons of prices in each of the PMPRB's seven comparator countries to corresponding Canadian prices. Focusing on the results with currency conversion at market exchange rates, it appears that, as in previous years, Canadian prices were typically within the range of prices observed among the comparator countries. Prices in France, Italy, the United Kingdom and Sweden were appreciably lower than Canadian prices, while those in Germany and Switzerland were higher. As in previous years, prices reported for the United States were much higher than prices in Canada or any other comparator country.

It is important to note that it is not always possible to find a matching foreign price for each and every patented drug product sold in Canada. Table 12 displays how often an international price comparison was available for each of the comparator countries. For example, out of 1,419 patented drug products under the PMPRB's jurisdiction in 2016, a publicly available ex-factory price for France was available 52.3% of the time, whereas for the US the number was 78.9%. Given the integrated nature of the Canadian and US supply chain, it is not uncommon for the US to be the only other country for which a comparator price to a product sold in Canada is available, in which case it is deemed to constitute the international median price as per the PMPRB's methodology.

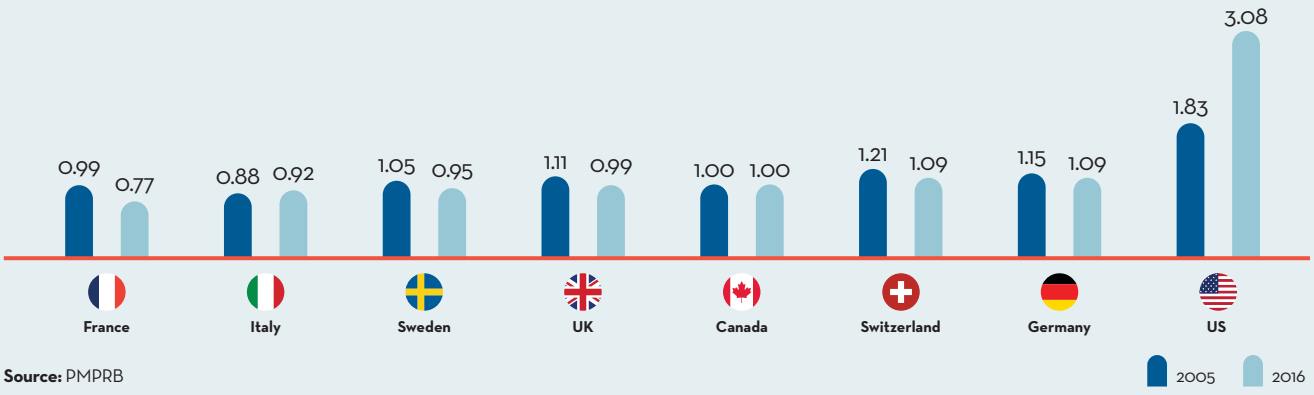
Average price ratios obtained with currency conversion at PPPs tell the same story. When international differences in cost of living are accounted for, it appears Canadians incurred a larger consumption cost for the patented drug products they purchased in 2016 than did residents of every other comparator country except Germany, Italy and the United States.

Figure 12 puts these results in historical perspective. In 2005, Canadian prices were, on average, approximately equal to or below corresponding prices in all comparators other than Italy. By 2016, Canadian prices were decidedly above prices in the United Kingdom, France Italy and Sweden.

If the patented medicine is being sold in one or more of the comparator countries (PMPRB7), the patentee must report the publicly available ex-factory prices to the PMPRB for each class of customer.[16] In order to assess how Canada compares to a basket of countries beyond the PMPRB7, Figure 13 uses Canadian and international prices reported in the IMS AG MIDAS™ database at the ex-factory manufacturer level, reflecting all sales to the pharmacy and hospital sectors.

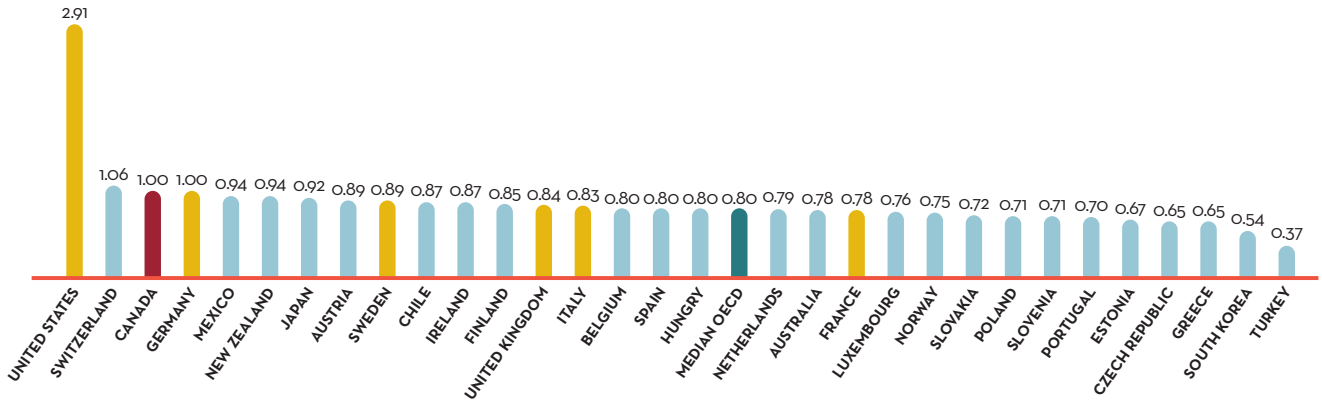
The international price comparisons reported in Figure 13 provide a bilateral price comparison using all countries in the Organisation for Economic Co-operation and Development (OECD) available in IMS AG's MIDAS™. The average foreign-to-Canadian price ratios are constructed using exactly the same approach employed to produce the ratios presented in Figure 12. These are Canadian sales-weighted arithmetic averages of the corresponding foreign-to-Canadian price ratios for individual drugs.[17] As shown below, median OECD prices are on average approximately 20% below prices in Canada, which are third highest among the 31 countries and on par with Germany. Notably, the top three priced countries are now the US, Switzerland and Canada.

Figure 12. Average Foreign-to-Canadian Price Ratios, 2005, 2016



Source: PMPRB

Figure 13. Average Foreign-to-Canadian Price Ratios, Patented Drugs, OECD, 2016



Source: MIDAS™ database, 2005-2016, IMS AG. All rights reserved.

Table 13. Average Foreign-to-Canadian Price Ratios, Multilateral Comparisons, 2016

	Median	Minimum	Maximum	Mean
Average price ratio at market exchange rates	1.25	0.99	3.01	1.49
Average price ratio at purchasing power parities	1.24	0.98	3.09	1.51
Number of patented drug products	1,313	1,313	1,313	1,313
Sales ($millions)	15,085.18	15,085.18	15,085.18	15,085.18

Source: PMPRB

MULTILATERAL PRICE COMPARISONS

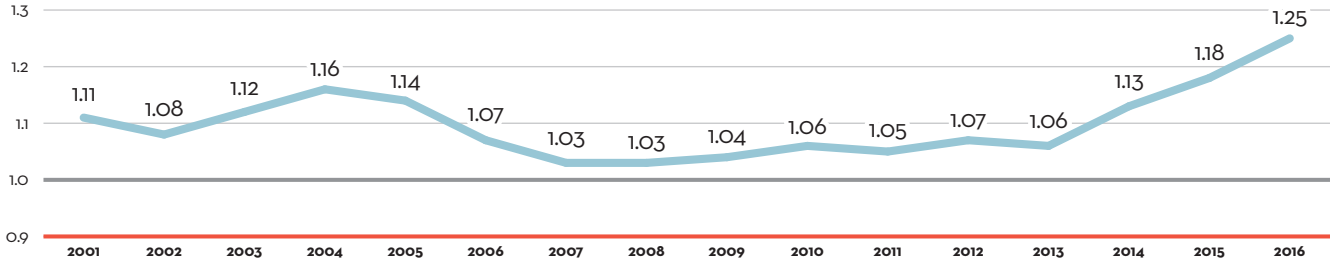
Table 13 provides average foreign-to-Canadian price ratios using several multilateral measures of foreign prices. The median international price (MIP) is the median of prices observed among the seven comparator countries. Other multilateral price ratios compare the minimum, maximum and simple mean of foreign prices to their Canadian counterparts.

Focusing again on results at market exchange rates, the average MIP-to-Canadian price ratio stood at 1.25 in 2016. (The corresponding value for 2015 was 1.18.) Note that mean foreign prices produce higher foreign-to-Canadian price ratios than do MIPs. This is explained by the influence of US prices, which are typically much higher than prices elsewhere. Although US prices nearly always figure importantly in determining mean foreign price, this is less so when it comes to median international prices. Nevertheless, the US does exercise a significant influence over the average ratio of median international prices relative to Canadian prices because of the not infrequent phenomenon mentioned in the previous section, whereby the US is the only country for which an ex-factory price for a patented drug product sold in Canada is available.

Figure 14 puts these results in historical perspective, giving a history of the average MIP-to-Canadian price ratios from 2001 to 2016. Although there has been considerable movement in the ratio over this period, it has remained above parity.

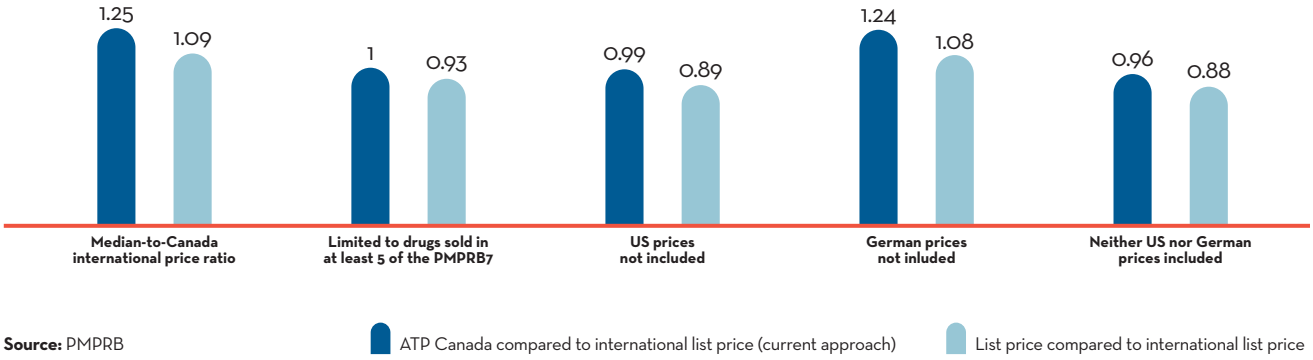
Figure 15 provides alternate results for the average MIP-to-Canadian price ratio at market exchange rates in 2016. To address the point that Canadian prices are national average transaction prices whereas foreign prices are list prices, a list price to list price ratio is also calculated. Using this method, the average ratio decreases from 1.25 to 1.09. It is important to keep in mind that non-transparent rebates provided to payers are currently not captured in these data.

Figure 14. Average Ratio of Median International Price (MIP) to Canadian Price, at Market Exchange Rates, 2001–2016



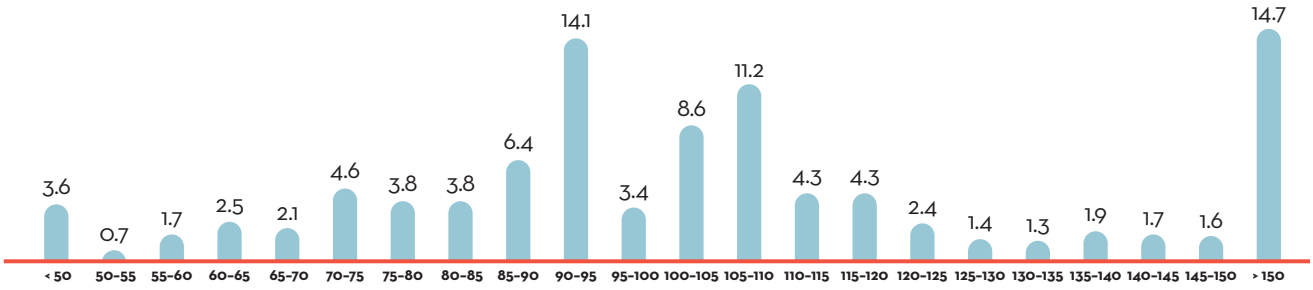
Source: PMPRB

Figure 15. Average Ratio of Median International Price (MIP) to Canadian Price, at Market Exchange Rates, 2016



Source: PMPRB

Figure 16. Range Distribution, Sales, by MIP-to-Canadian Price Ratio, 2016



Source: PMPRB

To account for the large impact of US prices in determining the median foreign price, a ratio excluding the US and a ratio including at least five countries in the calculation of the median are also provided in Figure 15. With these restrictions, the average MIP-to-Canadian price ratio drops to 0.89 and 0.93, respectively, suggesting that Canadian list prices are on average 7%-11% higher than median foreign list prices. In many of the comparator countries, discounts off list prices are available to all payers, both public and private. By contrast, a large portion of the Canadian market pay list prices or close to list prices. Furthermore, it should be noted that these are average ratios—some patentees charge Canadian consumers less than median international prices, while others charge more. For patentee level median-to-Canadian price ratios, please refer to Table 24 in Appendix 3 of this report.

Figure 16 offers more detail on the product-level MIP-to-Canadian ratios underlying the averages reported in Table 13. This figure distributes the 2016 sales of each patented drug product according to the value of its MIP-to-Canadian price ratio (more exactly, according to the range into which the ratio fell).[18] These results show substantial dispersion in product-level price ratios: while patented drug products with MIP-to-Canadian price ratios between 0.90 and 1.10 accounted for 37.3% of sales, those with ratios less than 0.90 accounted for 29.2% of sales, and products with ratios exceeding 1.10 accounted for 33.6%.

In 2016, approximately 50% of Canadian patented drug products were priced above the median international level.[19] Table 14 shows which therapeutic categories in particular are priced above the median international levels in Canada. Drugs that share the fourth level ATC ("ATC4")[20] are grouped to identify distinct chemical/pharmacological/ therapeutic subgroups, allowing for a calculation of the average MIP-to-Canadian price ratios among drugs that may be used to treat the same conditions. Table 14 identifies the top 10 ATC4s in 2016 in which the difference between Canadian and median prices had the largest effect on Canadian patented medicine spending. For example, had Canadian prices been in line with the international median for these classes of drugs in 2016, sales in Canada would have been reduced by $794 million (an average reduction of 16% for these ATC4s). Of the 123 DINs classified into these 10 ATC4s, over 68% were priced above the median international price.

Table 14. Top-10 ATC4s by Total Revenues Greater than Median International Prices, 2016

Description	ATC4	# of companies	Total # of Chemicals in ATC4 (# currently under patent)[21]	Total Patented DINS	Patented DINs greater than median price	2016 Net Revenue for Patented DINs ($)	Patented DINs ATC4 Share of 2016 Revenues	MIP-to-Canada ratio (min 5) of Patented DINs	$ Impact of Difference on patented drugs in 2016 ($)
Adrenergics in combination with corticosteroids or other drugs excluding anticholinergics	R03AK	3	5(5)	11	9	$543,451,835.08	3.50%	61%	$199,055,072.31
Antineovascularisation agents	S01LA	2	2(2)	3	3	$593,565,286.65	3.80%	84%	$128,113,966.66
Other antidepressants	N06AX	7	7(6)	11	5	$234,397,100.29	1.50%	50%	$78,362,223.95
Tumor necrosis factor alpha inhibitors	L04AB	3	4(3)	7	1	$1,074,437,530.77	6.90%	88%	$70,207,891.05
DPP-4 inhibitors	A10BH	4	4(4)	9	9	$267,114,372.22	1.70%	73%	$63,293,437.50
Glucocorticoids	R03BA	9	10(6)	15	10	$182,585,300.05	1.20%	82%	$54,323,337.35
Combinations of oral blood glucose lowering drugs	A10BD	6	13(13)	31	19	$242,486,725.25	1.50%	68%	$52,858,775.75
Selective immunosuppressants	L04AA	18	22(16)	28	21	$1,408,148,492.13	9.10%	99%	$49,815,389.90
Colony stimulating factors	L03AA	3	4(4)	4	3	$188,089,000.34	1.20%	64%	$49,495,790.86
Insulins and analogues for injection, long-acting	A10AE	3	4(2)	4	4	$256,522,336.48	1.70%	79%	$48,036,062.66

Source: PMPRB

CANADA IS A TOP 10 GLOBAL MARKET

Canada is an important market for pharmaceuticals representing 1.9% of worldwide sales. Canada is consistently in the top 10 global markets for pharmaceuticals. Despite this, R&D-to-sales ratios are on average 5 times higher in PMPRB comparator countries than Canada, whereas prices are lower in the majority of these countries.

(Endnotes)

15 The number of drug products and sales these ratios encompass vary because it is not always possible to find a matching foreign price for each patented drug product sold in Canada. Note that all of the bilateral average price ratios reported in Table 12 combined represent at least 61% of 2016 Canadian sales, while the multilateral ratios in Table 13 cover over 97%.

16 The publicly available ex-factory price includes any price of a patented medicine that is agreed on by the patentee and the appropriate regulatory authority of the country.

17 IMS AG's MIDAS™ database is the source of sales data used in this analysis. MIDAS™ summarizes data obtained from IMS AG's detailed audits of pharmaceutical purchases. MIDAS™ contains information on sales of individual products, measured in both currency and physical units. It also includes information on product manufacturer, active ingredient, brand, form, strength, pack-size, patent status and therapeutic class. Sales estimates are based directly on the purchase information obtained in its pharmacy audits. To obtain the value of a company's ex-factory sales of a particular product, IMS AG removes an estimate of wholesalers' mark-ups from the acquisition costs reported. It should be noted that the acquisition costs used by IMS AG are based on invoiced prices. Off-invoice discounts, free goods and other forms of price reduction such as rebates are therefore not represented in the MIDAS™ data.

18 To produce the results represented in this figure, foreign prices were converted to their Canadian-dollar equivalents at market exchange rates.

19 This outcome is not inconsistent with the current Excessive Price Guidelines which allow, post introduction, annual price increases in line with general inflation, as long as prices remain below the highest international price.

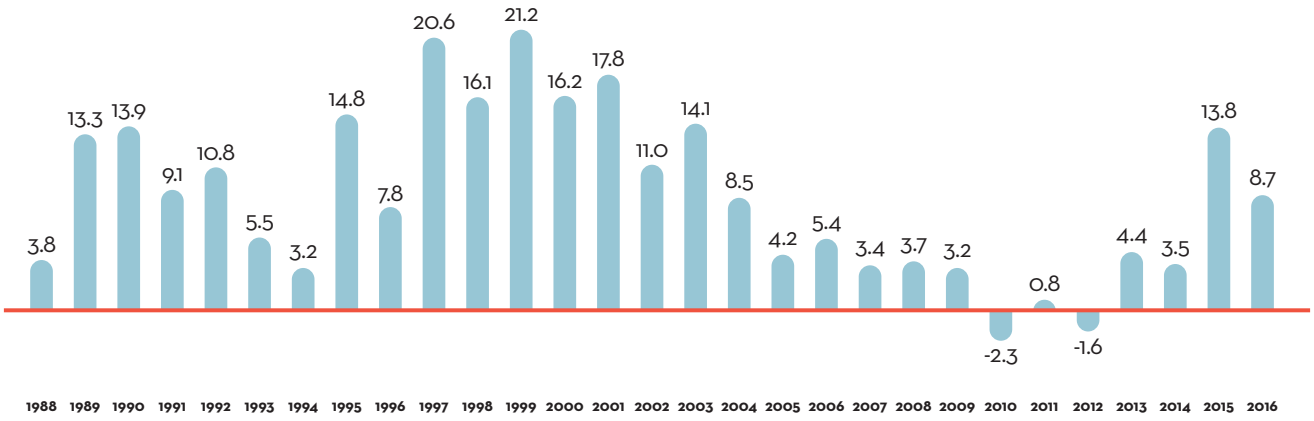
20 ATC's used in this analysis are those maintained under the World Health Organization's Collaborating Centre for Drug Statistics Methodology. The first level of an ATC code describes the anatomical main group and has one letter. The second level divides the main groups into pharmacological/therapeutic groups and has two digits. The third and fourth levels divide these into distinct chemical/therapeutic/pharmacological subgroups and each has one letter. The fifth level defines an individual chemical substance and has two digits. For example, in the case R03AK (as found in Table 14), "R" indicates that the drugs treat the Respiratory System; "03" that they specifically treat obstructive airway diseases; "A" that they consist of adrenergics and inhalants; and "K" that they are specifically adrengenics in combination with corticosteroids or other drugs excluding anticholinergics. A specific chemical combination that is a member of this group is salmeterol xinafoate with fluticasone propionate (Advair), and is represented by the fifth level ATC R03AK06. For further information, please refer to *http://www.whocc.no/atc ddd index/*

21 For further detail, the chemicals included in Table 14 under PMPRB jurisdiction are: **A10AE** (insulin (ultralente) human biosynthetic, insulin detemir, insulin glargine, pork/bovine insulin/zinc), **A10BD** (alogliptin benzoate/metformin hydrochloride, canagliflozin and metformin hydrochloride tab, canagliflozin/metformin hydrochloride tablets, dapagliflozin and metformin hydrochloride, empagliflozin/linagliptin, empagliflozin/metformin hydrochloride, linagliptin/metform, rosiglitazone maleate/glimepiride, rosiglitazone maleate/metformin hydrochloride, saxagliptin/metformin, sitagliptin phosphate monohydrate and metform, sitagliptin phosphate monohydrate/metformin h, sitagliptin phosphate/metformin hydrochloride), **A10BH** (alogliptin benzoate, linagliptin, saxagliptin, sitagliptin phosphate), **L03AA** (ancestim, filgrastim, pegfilgrastim, sargramostim), **L04AA** (abatacept, adalimumab, alefacept, anakinra, basiliximab, belimumab, cyclosporine, daclizumab, eculizumab, efalizumab, everolimus, fingolimod hydrochloride, leflunomide, muromonab-cd3, mycophenolate mofetil, mycophenolate sodium, natalizumab, sirolimus, tacrolimus, teriflunomide, tofacitinib, vedolizumab), **L04AB** (certolizumab pegol, etanercept, golimumab, infliximab), **N06AX** (desvenlafaxine succinate, duloxetine (as duloxetine hydrochloride), levomilnacipran, mirtazapine, nefazodone hydrochloride, trazodone hydrochloride, vortioxetine hydrobromide), **R03AK** (budesonide/formoterol fumarate, fluticasone furoate/vilanterol, fluticasone furoate/vilanterol, mometasone furoate/formoterol fumarate, salmeterol xinafoate/fluticasone propionate), **R03BA** (beclomethasone dipropionate,budesonide, ciclesonide, ciclesonide nasal aerosol, flunisolide, fluticasone propionate, fluticasone propionate inhalation aerosol, fluticasone propionate powder for inhalation, mometasone furoate, mometasone furoate dry powder inhaler, triamcinolone acetonide), **S01LA** (aflibercept, ranibizumab).

UTILIZATION OF PATENTED DRUG PRODUCTS

The price and sales data used to calculate the PMPI also allow the PMPRB to examine trends in the quantities of patented drug products sold in Canada. The PMPRB maintains the Patented Medicines Quantity Index (PMQI) for this purpose. Figure 17 provides average rates of utilization growth, as measured by the PMQI, from 1988 through 2016. These results confirm that in recent years, growth in the utilization of patented drug products has been the primary source of rising sales, with rates of utilization growth roughly tracking sales growth. This tracking pattern continued in 2016, with utilization of patented drug products, on average, increasing by 8.7% between 2015 and 2016 and sales increasing by 2.6%.

Figure 17. Annual Rate of Change (%), Patented Medicines Quantity Index (PMQI), 1988–2016



Source: PMPRB

UTILIZATION GROWTH BY THERAPEUTIC CLASS

Table 15 provides average rates of utilization growth among patented drug products at the level of major therapeutic classes. The results in this table were obtained by applying the PMQI methodology to data segregated by ATC Level I class. As in Table 11, the last column provides an approximate decomposition of overall PMQI change into contributions attributable to each therapeutic class.

In 2016, levels of utilization increased in ten therapeutic classes. Increased consumption of various, blood and blood forming organs, systemic hormonal preparations, and antineoplastics and immunomodulating agents accounted for most of the growth in overall utilization.

Table 15. Change in the Patented Medicines Quantity Index (PMQI), by Major Therapeutic Class, 2016

Therapeutic class	Share: 2016 sales (%)	Quantity change: 2015–2016 (%)	Contribution: change in PMQI (%)
A: Alimentary tract and metabolism	11.1	7.44	0.83
B: Blood and blood forming organs	5.7	15.56	0.89
C: Cardiovascular system	5.4	4.77	0.26
D: Dermatologicals	0.8	-2.36	-0.02
G: Genito-urinary system and sex hormones	2.6	-6.46	-0.17
H: Systemic hormonal preparations	0.5	12.48	0.06
J: General antiinfectives for systemic use and P: Antiparasitic products*	14.4	6.81	0.98
L: Antineoplastics and immunomodulating agents	33.2	12.36	4.10
M: Musculo-skeletal system	2.6	8.35	0.22
N: Nervous system	10.0	-2.24	-0.22
R: Respiratory system	8.0	2.71	0.22
S: Sensory organs	5.2	2.71	0.14
V: Various	0.6	16.80	0.10
All therapeutic classes	**100.0†**	**8.7**	**8.7**

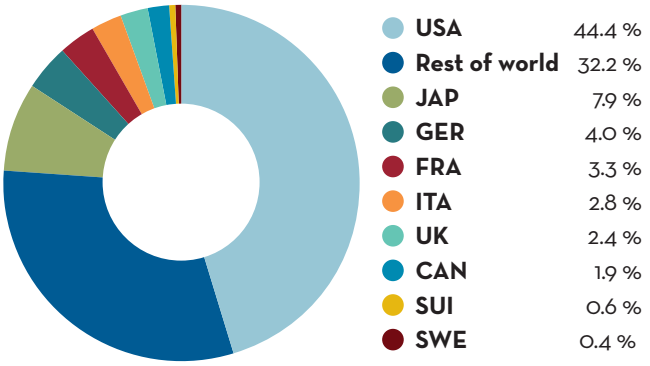
† Values in this column may not add to 100.0 due to rounding.
* These groups have been combined for reasons of confidentiality.

Source: PMPRB

CANADIAN DRUG EXPENDITURES IN THE GLOBAL CONTEXT

IMS Health[22] regularly reports on drug sales across a large number of countries. Based on sales data from this source, Figure 18 provides shares of global sales for Canada and each of the seven comparator countries that the PMPRB considers in conducting its price reviews (PMPRB7).[23] The Canadian market accounted for 1.9% of the global market in 2016.

Figure 18. Distribution of Drug Sales Among Major National Markets, 2016



Source: MIDAS™, database, 2005–2016, IMS AG. All rights reserved.[24]

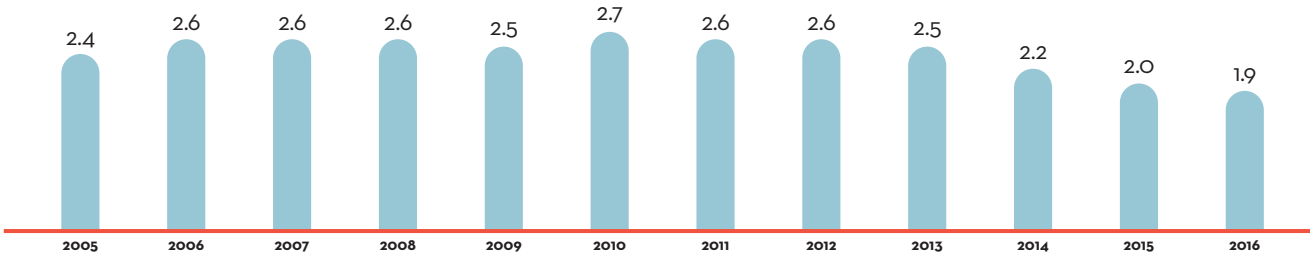
Figure 19 provides Canada's share of global sales for 2005 to 2016. The Canadian share has remained between 1.9% and 2.7% throughout this period. Though 1.9% is at the low end for Canada's average share of global sales in recent years, and marks the sixth year in a row that Canada's share has fallen, this trend is driven by rapid price increases in the United States, which grew the US share from 40.4% in 2014 to 44.4% in 2016, resulting in declining shares for all other major countries.

Figure 20 gives the average annual rate of growth in total drug sales for Canada and the seven comparator countries, individually and collectively (PMPRB7). From 2005 to 2016, drug sales in Canada rose at an average annual rate of approximately 4.1%. This is less than the average rate of growth in drug sales among the seven comparator countries over the same period, though as is clear from the figure, this growth rate is heavily skewed by the influence of US sales on the total revenues of the PMPRB7.

Figure 21 compares rates of year-over-year growth in drug sales in Canada and the comparator countries combined (PMPRB7). In 2016, for the seventh consecutive year, sales grew at a slower rate in Canada than the PMPRB7 total. As identified in the discussion of Figures 14 and 15, however, the presence of the US skews these results. Accordingly, the median of the PMPRB7 expenditure growth rate has been added to this figure, showing that Canadian expenditure growth rate has tracked the PMPRB7 expenditure growth rate quite closely since 2010.

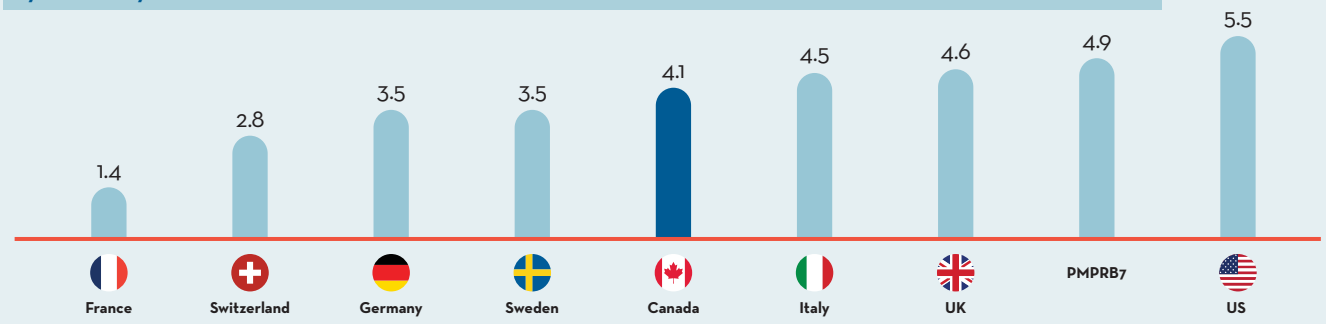
The proportion of national income allocated to the purchase of drug products provides another way to compare drug costs across countries.[25] Figure 22 gives drug expenditures as a share of Gross Domestic Product (GDP) for Canada and the seven comparator countries based on data for 2014. Drug expenditures absorbed between 1.0% and 2.0% of the GDP in the seven comparators. The Canadian value (1.7%) lies near the upper end of this range.

Figure 19. Canada's Share of Drug Sales, 2005–2016



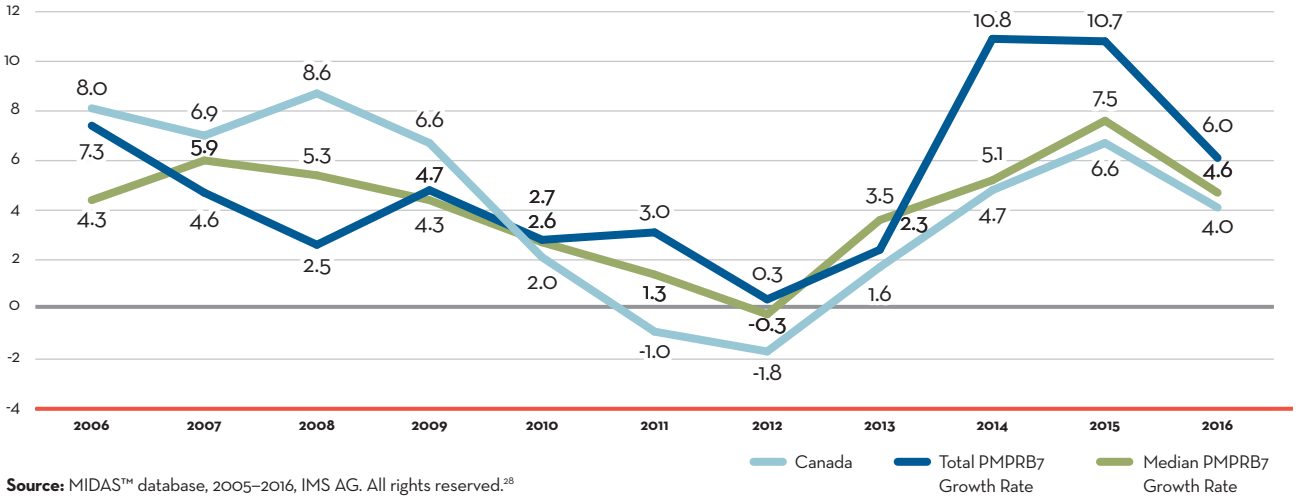
Source: MIDAS™ database, 2005–2016, IMS AG. All rights reserved.[26]

Figure 20. Average Rate of Growth (%), Drug Sales, at Constant 2016 Market Exchange Rates, by Country, 2005–2016



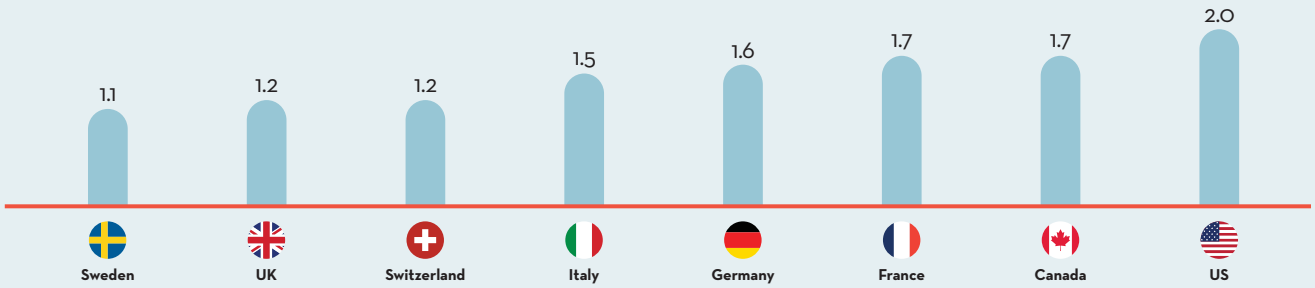
Source: MIDAS™ database, 2005–2016, IMS AG. All rights reserved.[27]

Figure 21. Average Annual Rate of Change in Drug Sales, at Constant 2016 Market Exchange Rates, Canada and Comparator Countries, 2006–2016



Source: MIDAS™ database, 2005–2016, IMS AG. All rights reserved.[28]

Figure 22. Drug Expenditures as a Share of GDP, 2014



Source: OECD

Table 16 provides a historical perspective on the expenditures-to-GDP ratio. In 2005, Canada's ratio was fourth highest of the PMPRB7. Since that time, Canada's ratio has risen, while the ratios of three other countries (France, Italy and Sweden) have declined. In 2014, Canada once again had the second highest drug spending per capita among the PMPRB7 (again behind only the United States), 18% higher than the median of these countries.

Table 17 gives the composition of patentees' sales by therapeutic class for Canada and the seven comparator countries, individually and as an aggregate (PMPRB7).[29] The results imply a remarkable degree of similarity across countries.

Table 16. Drug Expenditures as a Share of GDP, 2014[30]

	Share: Drug Expenditures/GDP 2014 (%)	Share: Drug Expenditures/GDP 2005 (%)	Growth: GDP 2005–2014 (%)	Drug Spending Per Capita 2005 ($US PPP)	Drug Spending Per Capita 2014 ($US PPP)
Canada	1.72	1.64	37.8	593	772
France	1.67	1.79	38.5	545	656
Germany	1.60	1.58	43.6	509	741
Italy	1.55	1.70	28.3	505	544
Sweden	1.08	1.15	45.2	396	489
Switzerland	1.23	1.09	72.1	427	730
United Kingdom	1.21	1.00	25.8	NA	485
United States	2.04	1.88	32.8	832	1,112

Source: OECD

Table 17. Distribution of Drug Sales (%) by Major Therapeutic Class for Canada and Comparator Countries, 2016

Therapeutic class	Canada	PMPRB7	France	Italy	Germany	Sweden	Switzerland	United Kingdom	United States
A: Alimentary tract and metabolism	12.9	14.6	9.9	9.9	10.9	9.7	10.9	10.8	15.8
B: Blood and blood-forming organs	4.5	5.2	7.8	8.2	7.3	8.6	5.7	5.5	4.6
C: Cardiovascular system	9.6	6.8	8.6	10.1	7.3	4.5	9.6	6.6	6.5
D: Dermatologicals	2.7	2.7	2.2	1.7	2.7	2.5	3.3	2.6	2.8
G: Genito-urinary system and sex hormones	4.5	4.2	2.9	3.4	3.0	3.9	4.2	3.6	4.5
H: Systemic hormonal preparations	1.3	2.4	2.2	1.8	2.0	2.3	1.6	3.0	2.5
J: General antiinfectives for systemic use	9.4	12.9	13.4	21.3	10.8	12.2	11.5	11.7	12.6
L: Antineoplastics and immunomodulating agents	19.5	20.4	22.1	17.7	23.8	23.5	21.5	20.4	20.1
M: Musculo-skeletal system	3.2	3.2	2.9	3.2	3.9	3.7	5.5	2.5	3.2
N: Nervous system	17.3	14.9	13.2	10.7	13.1	16.3	15.5	16.8	15.3
P: Antiparasitic products	0.2	0.2	0.2	0.0	0.2	0.1	0.1	0.1	0.2
R: Respiratory system	7.2	6.7	6.0	5.0	6.7	6.9	5.9	8.5	6.8
S: Sensory organs	4.2	2.5	3.3	2.0	3.1	3.1	4.1	4.4	2.3
V: Various	3.6	3.2	5.3	5.0	5.3	2.7	0.7	3.6	2.8
All therapeutic classes'	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

' Values may not add to 100.0 due to rounding.
Source: MIDAS™, 2005-2016, IMS AG. All rights reserved.[31]

(Endnotes)

22 Most of the statistical results presented in this section are based on sales data from MIDAS™ database, 2005-2016, IMS AG. All rights reserved. These data cover the pharmacy and hospital sectors.

23 The results given in Figures 18 through 23 are based on estimates of ex-factory sales revenues encompassing patented, non-patented branded and generic drug products. These estimates have been converted to Canadian dollar equivalents at annual average market exchange rates. Fluctuations in these rates can substantially influence these shares.

24 Although based in part on data obtained under license from the IMS AG MIDAS™ database, the statements, findings, conclusions, views and opinions expressed in this Annual Report are exclusively those of the PMPRB and are not attributable to IMS AG.

25 Comparisons made on this basis will reflect international differences in prices, overall utilization and patterns of therapeutic choice, as well as differences in national income.

26 Although based in part on data obtained under license from the IMS AG MIDAS™ database, the statements, findings, conclusions, views and opinions expressed in this Annual Report are exclusively those of the PMPRB and are not attributable to IMS AG.

27 Ibid.

28 Ibid.

29 Note that the data used to produce Table 17 encompass patented, non-patented branded and generic drug products. Hence, the results reported here for Canada are not directly comparable to those reported in Table 9, which encompass only patented drug products.

30 In order to make use of the best and most up-to-date available drug expenditure data from the OECD, the GDP in Table 16 was calculated using the Purchasing Power Parity (PPP). Due to the fact that PPPs are corrected for relative cost of living based on a standard basket of goods, the GDP growth rates reported in Table 16 are different than those that would be generated using other methodologies. For further details on the Purchasing Power Parity, please see the explanation associated with Table 12. UK data has been revised in 2016 for year 2014.

31 Although based in part on data obtained under license from the IMS AG MIDAS™ database, the statements, findings, conclusions, views and opinions expressed in this Annual Report are exclusively those of the PMPRB and are not attributable to IMS AG.

THE NATIONAL PRESCRIPTION DRUG UTILIZATION INFORMATION SYSTEM: SUPPORTING HEALTH-CARE DECISION MAKING IN CANADA

How medications are used—where, by whom and for what—has an impact on the amount that we spend on drugs. The PMPRB contributes to Canada's understanding of drug usage through the National Prescription Drug Utilization Information System (NPDUIS) initiative, generating comprehensive, accurate information to help guide decision making and support continued sustainability of our pharmaceutical system.

BACKGROUND

The National Prescription Drug Utilization Information System (NPDUIS) is a research initiative established by federal, provincial, and territorial Ministers of Health in September 2001. It is a partnership between the PMPRB and the Canadian Institute for Health Information (CIHI). The PMPRB conducts critical analyses of price, utilization and cost trends for patented and non-patented prescription drugs under the NPDUIS at the request of the Minister of Health pursuant to section 90 of the *Patent Act*.

Its purpose is to provide policy makers and public drug plan managers with critical analyses of price, utilization and cost trends, so that Canada's health care systems has more comprehensive and accurate information on how prescription drugs are being used and on sources of cost increases.

The NPDUIS Advisory Committee, composed of representatives from public drug plans in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, Yukon, and Health Canada, advises the PMPRB on its research agenda and on individual studies. The Committee also includes observers from CIHI, the Canadian Agency for Drugs and Technologies in Health (CADTH), the Ministère de la Santé et des Services sociaux Québec, and the pan-Canadian Pharmaceutical Alliance (pCPA) Office.

HIGHLIGHTS

Since the last Annual Report, through the NPDUIS initiative, the PMPRB has released three analytical reports and six posters.

Published Reports:

- *Market Intelligence Report: Biologic Response Modifier Agents, 2015 (October 2016)*
- *Meds Entry Watch, 2015 (April 2017)*

- *CompassRx: Annual Public Drug Plan Expenditure Report, 3rd Edition (May 2017)*

Poster Presentations:

- *The Canadian Market for Biologic Response Modifier Agents, 2015*
- *Drug Cost Drivers in Canadian Public Drug Plans, 2015/16*
- *Generic Drugs in Canada, 2015*
- *A Review of Public Coverage of CDR Reviewed Drugs*
- *A Review of Public and Private Coverage of iJODR/pCODR Reviewed Drugs*
- *Potential Savings from Biosimilars in Canada*

In addition, the NPDUIS conducted a number of ad-hoc studies at the request of the NPDUIS participating jurisdictions.

The PMPRB continued to support and strengthen its NPDUIS engagement activities by regularly consulting with the NPDUIS Advisory Committee, participating in conferences and stakeholder committees, hosting information exchange sessions with researchers, and organizing information sessions with interested stakeholders to share the results of the analytical studies.

Synopses of the three most recent studies are provided in this report.

MARKET INTELLIGENCE REPORT: BIOLOGIC RESPONSE MODIFIER AGENTS, 2015

The recently launched NPDUIS *Market Intelligence Report* analytical series provides drug pricing and utilization information on specific therapeutic market segments of importance to Canadians.

The first report in this series explores the market impact of biologic disease-modifying antirheumatic drugs (DMARDs), which are used in the treatment of chronic inflammatory diseases such as rheumatoid arthritis Crohn's disease, ulcerative colitis and psoriasis. The report explores the utilization, market shares, pricing, and treatment costs from a national and international perspective, with a retrospective look at recent trends. It also describes the drug portfolio of the manufacturers operating in this space and identifies opportunities for potential cost savings based on international and domestic market trends.

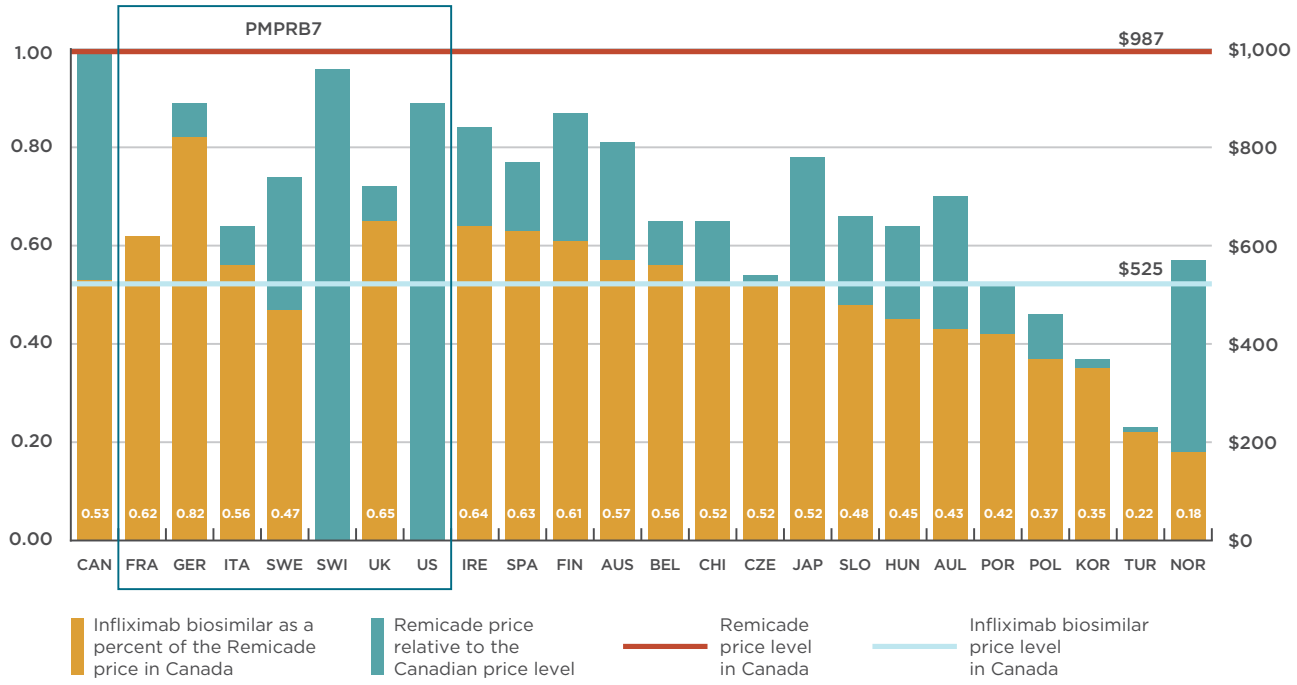
KEY FINDINGS

- Biologic DMARDs accounted for 10.3% of the Canadian pharmaceutical market in 2015. This market share was higher than in almost all the PMPRB7 countries.
- The growth in Canadian sales of biologic anti-inflammatory drugs has nearly doubled since 2010, reaching $2.2 billion in 2015.
- The top-selling biologic, Remicade, accounted for nearly 40% of the Canadian market for biologic DMARDs; the market share was much lower in the PMPRB7 countries, ranging from 12% to 23% in 2015, with a median list price 25% less than in Canada. This price difference translates into $224 million in drug sales or 1.0% of the entire Canadian pharmaceutical market.
- While the price of Inflectra, a biosimilar of Remicade, in Canada is in line with the average international level, the uptake in sales in 2015 was relatively modest. If the use of the biosimilar in Canada had mirrored the median use in the OECD (Organisation for Economic Co-operation and Development) countries (10.1%), it would have translated into a $41.7 million reduction in drug expenditures in 2015.
- There has been a growing gap between Canadian and foreign prices for biologic DMARDs, as Canadian prices have been slowly increasing at a rate lower than the rate of inflation, while the prices in the PMPRB7 countries (except in the US market) have been flat or declining.

Trends in prices for biologic DMARDs
Canada versus PMPRB7*, 2011 to 2015

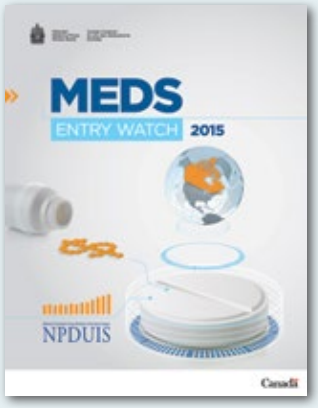
*France, Germany, Italy, Sweden, Switzerland, the United Kingdom and the United States.
Source: MIDAS™ Database, 2011 to 2015, IMS AG. All rights reserved.

Pricing of biosimilars for Remicade
Canada versus PMPRB7* and other OECD† countries, 2015



*France, Germany, Italy, Sweden, Switzerland, the United Kingdom and the United States.
†Ireland, Spain, Finland, Austria, Belgium, Chili, the Czech Republic, Japan, Slovakia, Hungry, Australia, Portugal, Poland, South Korea, Turkey and Norway.
Source: MIDAS™ Database, January–December 2015, IMS AG. All rights reserved.

MEDS ENTRY WATCH, 2015



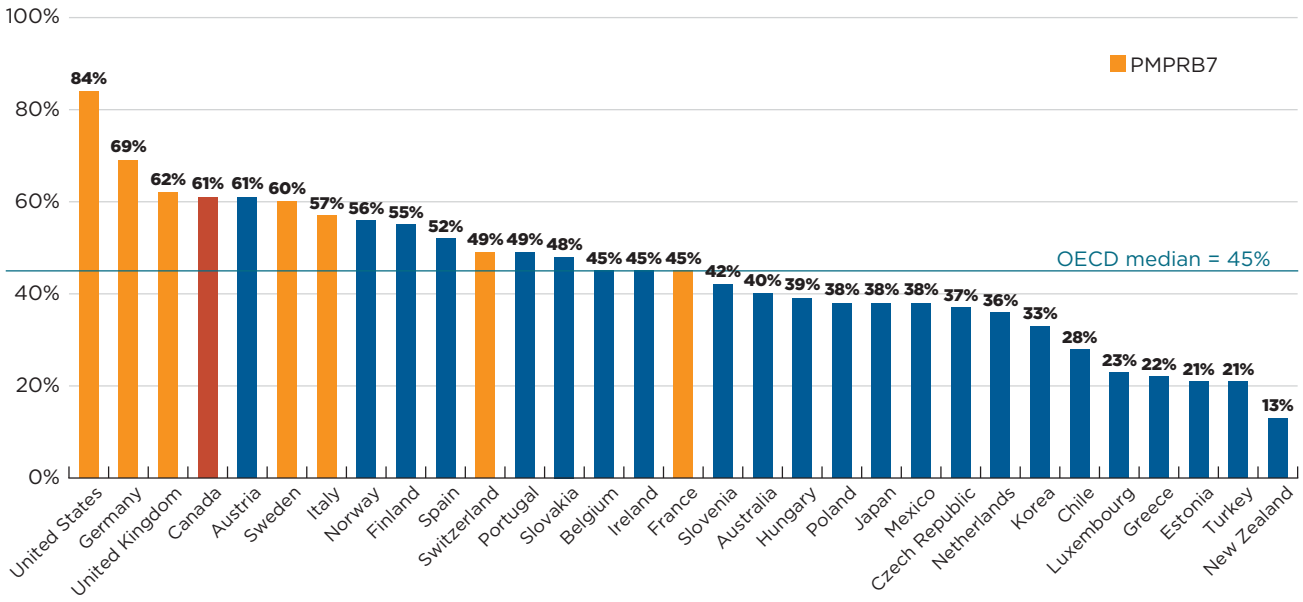
The *Meds Entry Watch* is a new NPDUIS annual publication that explores the market entry dynamics of new drugs launched in Canadian and international markets, including their availability, launch sequence, market penetration, sales and prices.

The first edition of this report includes a retrospective analysis of the new drugs launched over a six-year period from 2009 to 2014, as well as an early analysis of the drugs launched in 2015. The next edition of the *Meds Entry Watch* will build on this analysis and provide additional up-to-date information on new drugs launched in 2016.

KEY FINDINGS

- On average, 35 new active substances were launched each year between 2009 and 2014, for a total of 210. By the last quarter of 2015, the sales of these drugs accounted for 21.8% of the total brand-name pharmaceutical market in Canada and the PMPRB7.
- The availability of new drugs in Canada was similar to that in the international markets analyzed, with more than half the new drugs launched between 2009 and 2014 accounting for 97% of total domestic and foreign new drug sales in the last quarter of 2015.
- After an initial international launch, it took an average of 11 months for a new drug to be made available in Canada, which is well within the international norm; the 10 top-selling drugs had an even shorter average launch lag time of 3 months.
- The share of new products designated as orphan drugs increased in the countries analyzed from 17% in 2009 to 43% in 2015, with international list prices of 24 out of 35 new drugs launched in 2015 found to be in the hundreds or thousands of dollars.
- New direct-acting antiviral treatments for hepatitis C accounted for 25% of new drug sales in the countries analyzed in the last quarter of 2015.

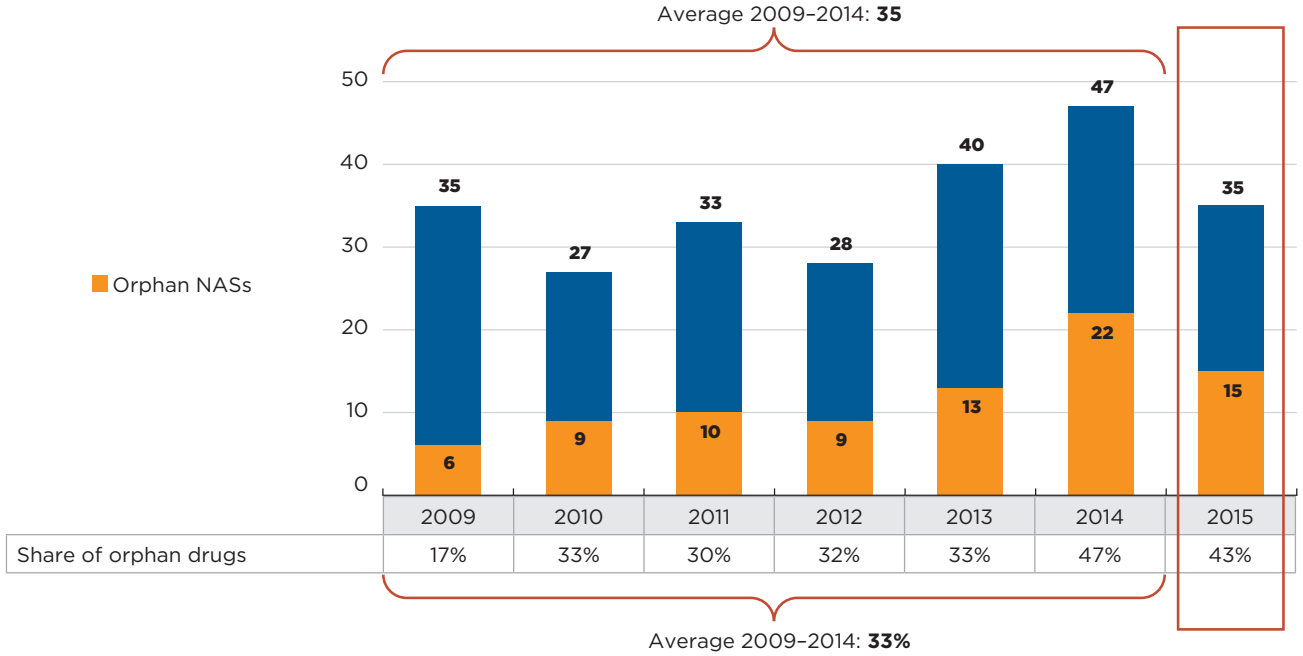
Share of NASs launched by OECD country, Q4-2015



Note: New active substances (NASs) launched between 2009 and 2014 in Canada and the PMPRB7. A NAS was considered to be launched in a particular country once sales data was available in MIDAS™. For the Canadian market, Health Canada's Drug Product Database and the Notice of Compliance database were cross-referenced to ensure that all NASs authorized for sale in Canada were accurately identified. Prices reported are manufacturer list prices.

Source: MIDAS™ Database, October–December 2015, IMS AG. All rights reserved.

Number of NASs by year of launch Canada and the PMPRB7*, 2009 to 2015



	2009	2010	2011	2012	2013	2014	2015
Share of orphan drugs	17%	33%	30%	32%	33%	47%	43%

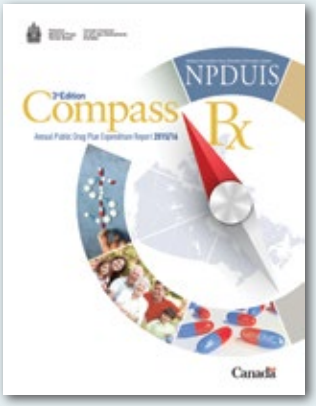
Average 2009–2014: **33%**

Note: New active substances (NASs) launched between 2009 and 2015. A NAS was considered to be launched in a particular country once sales data was available in MIDAS™. For this analysis, launches in the Canadian market were solely based on available MIDAS™ sales.

* France, Germany, Italy, Sweden, Switzerland, United Kingdom and the United States.

Source: MIDAS™ Database, 2009 to 2015, IMS AG. All rights reserved.

COMPASSRx, 3RD EDITION, ANNUAL PUBLIC DRUG PLAN EXPENDITURE REPORT, 2015/16

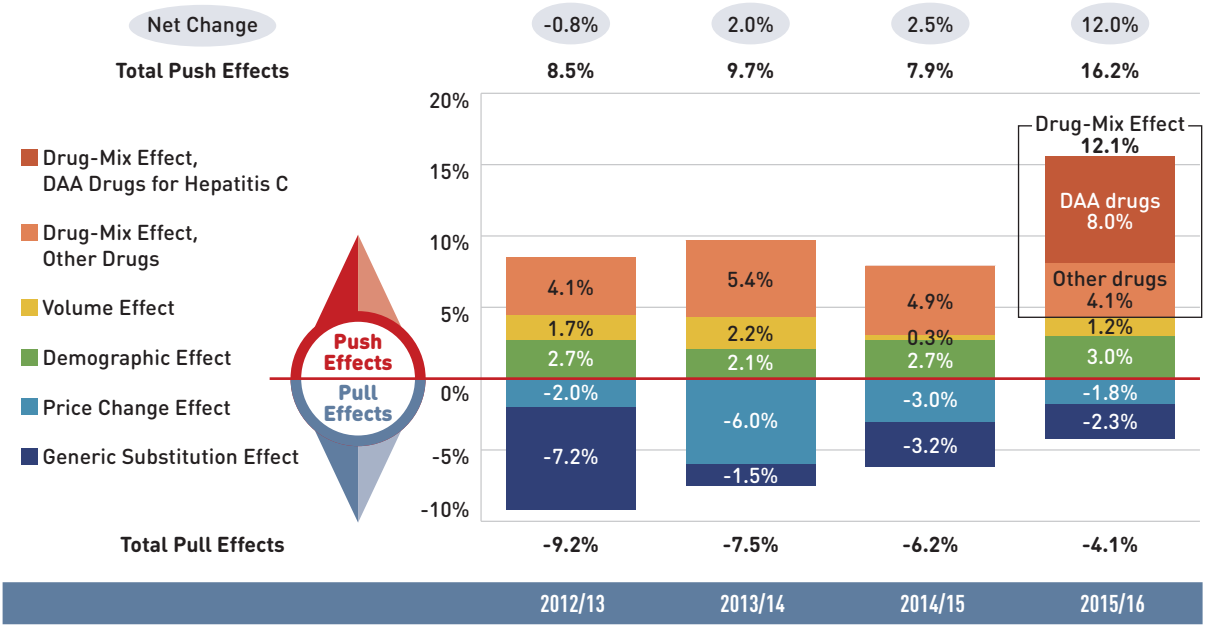


CompassRx is a flagship NPDUIS annual report that monitors and analyzes the major factors driving changes in prescription drug expenditures in public drug plans in Canada. The 2015/16 edition of this report identifies developing trends in drug use, demographics and pricing based on the results presented in previous publications.

KEY FINDINGS

- Prescription drug expenditures in the Canadian public drug plans totaled $11.3 billion in 2015–16, a $1 billion increase over the previous year.
- Drug costs, which accounted for three quarters of these expenditures, saw a 12% increase, with an 18.8% rise in the patented market segment.
- Patented drugs, the largest market segment at 58.5%, grew at a rate of 18.8% in 2015–16. Patented drugs exceeding $10,000 in annual treatment costs grew by 60.5%, accounting for 27.6% of drug costs, but were used by less than 1% of public drug plan beneficiaries.
- While new and curative treatments for hepatitis C were major contributors to this growth (8% of the 12% growth in drug costs), other high-costs drugs continued to put upward pressure on drug plan costs (4.1% of the 12% growth in drug costs).
- These relatively high rates of growth signal a shift in a previous trend of low growth marked by important savings from the "patent cliff" and generic drug price reforms, with the savings potential of these factors gradually diminishing in recent years and only partially counterbalancing cost pressures from higher-cost drugs in 2015–16.
- Drug costs were the largest component of total expenditures, accounting for nearly three quarters (74.7%) in 2015-16, followed by dispensing costs (21.8%), and reported markups (3.5%).

Drug cost drivers, NPDUIS public drug plans*, 2012/13 to 2015/16

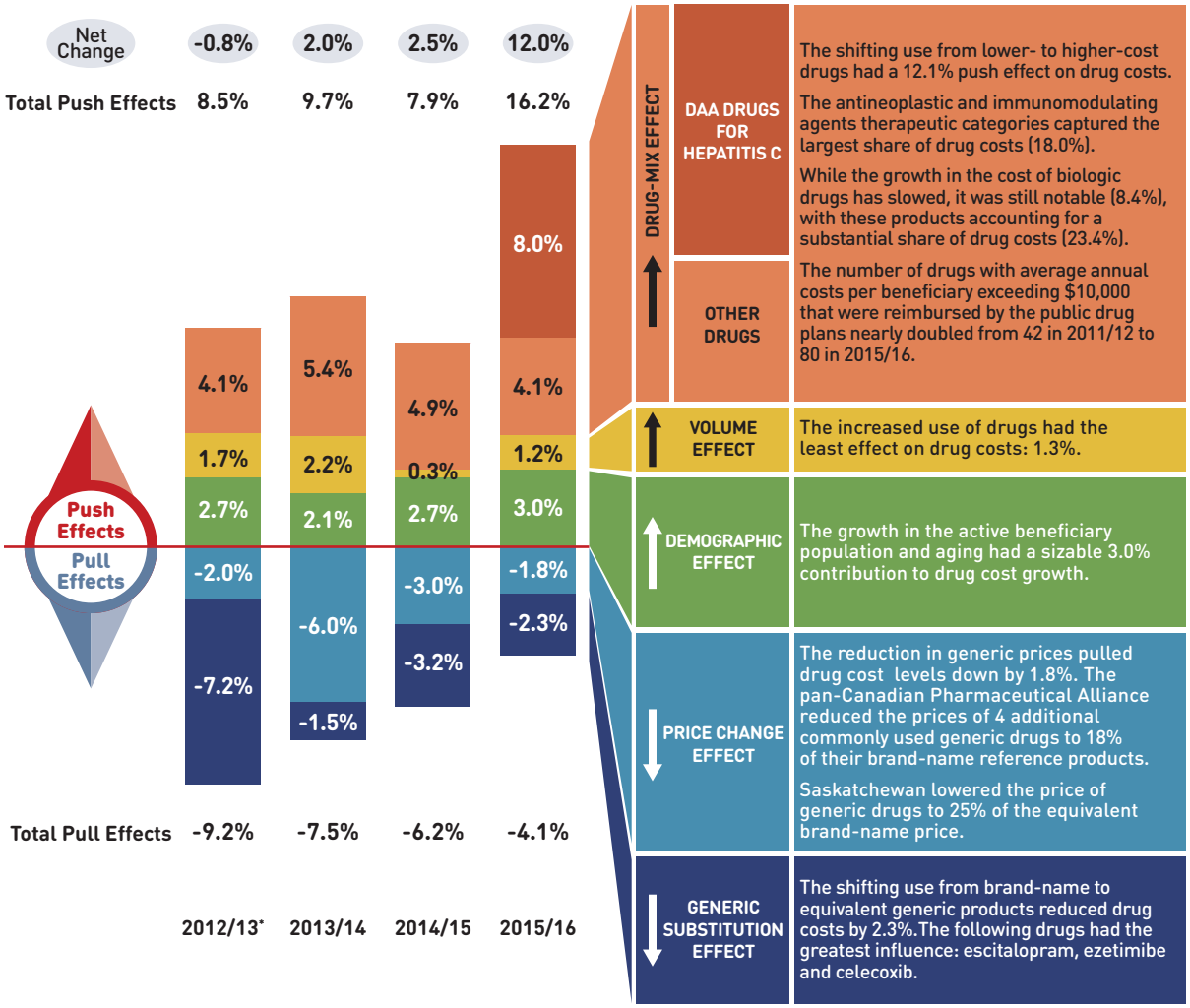


Note: Values may not add to totals due to rounding and the cross effect. Results for 2012/13 do not capture the data for the British Columbia and Newfoundland and Labrador provincial public drug plans.

* British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, and the Non-Insured Health Benefits Program.

Data source: National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

Overview of Drug Cost Drivers



* Results for 2012/13 do not capture the data for the British Columbia and Newfoundland and Labrador provincial public drug plans.

Note: Values may not add to totals due to rounding and the cross effect.

Data source: National Prescription Drug Utilization Information System Database, Canadian Institute for Health Information.

RESEARCH AGENDA

The NPDUIS research agenda for the two upcoming fiscal years includes the following analytical studies:

- *CompassRx, 4th Edition, 2016/17*
- *Meds Entry Watch, 2nd Edition, 2016*
- *Market Intelligence Report, 2nd Edition, 2016*
- *Generics360, 2016*
- *Private Drug Plans in Canada – Part 2: Cost Driver Analysis, 2015*
- *Private Drug Plans in Canada – Part 3: High-Cost Drugs and Beneficiaries, 2015*
- *Potential Savings from Biosimilars in Canada*
- *The Canadian Drug Reimbursement Landscape: A Review of Public and Private Markets*

Additional research topics may be pursued based on consultation with the NPDUIS Advisory Committee.

ANALYSIS OF RESEARCH AND DEVELOPMENT EXPENDITURES: R&D INVESTMENT FALLING SHORT OF TARGET

Innovation is vital to advancing health care. In part, the provisions of Canada's *Patent Act* are intended to foster an investment climate favorable to pharmaceutical research and development (R&D) in Canada. However, the percentage of R&D-to-sales by pharmaceutical patentees in Canada has been falling since the late 1990's and has been under the agreed-upon target of 10% since 2003. In 2016, it was at 4.4% for all patentees and 4.9% for members of Innovative Medicines Canada.

ANALYSIS OF RESEARCH AND DEVELOPMENT EXPENDITURES

The Act mandates the PMPRB to monitor and report on pharmaceutical R&D spending. This chapter provides key statistics on the current state of pharmaceutical R&D investment in Canada.

DATA SOURCES

The statistical results presented in this report were entirely derived from data that patentees submitted to the PMPRB.

The Act requires each patentee to report its total gross revenues from sales of all drugs for human or veterinary use (including revenues from sales of non-patented drug products and from licensing agreements) and R&D expenditures in Canada related to medicines (both patented and non-patented for human or veterinary use). Patentees transmit this information to the PMPRB by means of its Form 3 (*Revenues and Research and Development Expenditures Provided Pursuant to subsection 88(1)* of the *Patent Act*).

The *Patented Medicines Regulations* (Regulations) require that each submitted Form 3 be accompanied by a certificate stating the information it contains is "true and correct". The Board does not audit Form 3 submissions, but it does review submitted data for anomalies and inconsistencies, seeking corrections or clarifications from patentees where necessary. To confirm that PMPRB staff has correctly interpreted the data submitted, each patentee is given the opportunity to review and confirm the accuracy of its own R&D-to-sales ratio before that ratio is published.

FAILURE TO FILE R&D EXPENDITURES (FORM 3)

It is a patentee's responsibility to ensure a complete and accurate Form 3 is filed within the time frame set out in the Regulations. If a patentee fails to meet these filing requirements, the Board may issue an Order demanding compliance. There were no such Board Orders issued for the 2016 reporting period.

COVERAGE

Note that companies without sales of patented medicines do not need to report their R&D expenditures to the PMPRB. This has two implications.

First, the statistical results reported here should not be taken to cover all pharmaceutical research conducted in Canada. For example, a company may sell only non-patented drug products but may still perform considerable research in Canada. Similarly, a company may conduct research and have no product sales at all.[32] The results presented below will not reflect the R&D expenditures of firms in either situation.

Second, as new patented drug products come onto the Canadian market and existing patents expire, the number and identity of companies required to file R&D data may change from year to year. A total of 78 companies reported on their R&D activity in 2016. Of these, 32 were members of Innovative Medicines Canada.

DEFINITION OF SALES REVENUES

For reporting purposes, sales revenues are defined as total gross revenues from sales in Canada of all drug products and from licensing agreements (e.g., royalties and fees accruing to the patentee related to sales in Canada by licensees).

DEFINITION OF R&D EXPENDITURES

Pursuant to section 6 of the Regulations, patentees are required to report R&D expenditures that would have qualified for an investment tax credit in respect to scientific research and experimental development (SR&ED) under the provisions of the *Income Tax Act* that came into effect on December 1, 1987.[33] By this definition, R&D expenditures may include current expenditures, capital equipment costs and allowable depreciation expenses. Market research, sales promotions, quality control or routine testing of materials, devices or products and routine data collection are not eligible for an investment tax credit and, therefore, are not to be included in the R&D expenditures reported by patentees.

THE R&D-TO-SALES RATIO FOR ALL PATENTEES WAS 4.4% IN 2016.

This represents a 62% decrease from a peak of 11.7% in 1995.

TOTAL SALES REVENUES AND R&D EXPENDITURES

Table 18 provides an overview of reported sales revenues and R&D expenditures over the period 1988 through 2016.

Patentees reported total 2016 sales revenues of $ 20.8 billion, an increase of 5.9% from 2015. Sales revenues reported by Innovative Medicines Canada members were $15.6 billion, accounting for 75% of the total. (Less than 1% of reported sales revenues were generated by licensing agreements.)

Patentees reported R&D expenditures of $918.2 million in 2016, an increase of 5.7% over 2015. Innovative Medicines Canada members reported R&D expenditures of $769.9 million in 2016, an increase of 0.3% over last year. Innovative Medicines Canada members accounted for 83.9% of all reported R&D expenditures in 2016.

R&D-TO-SALES RATIOS

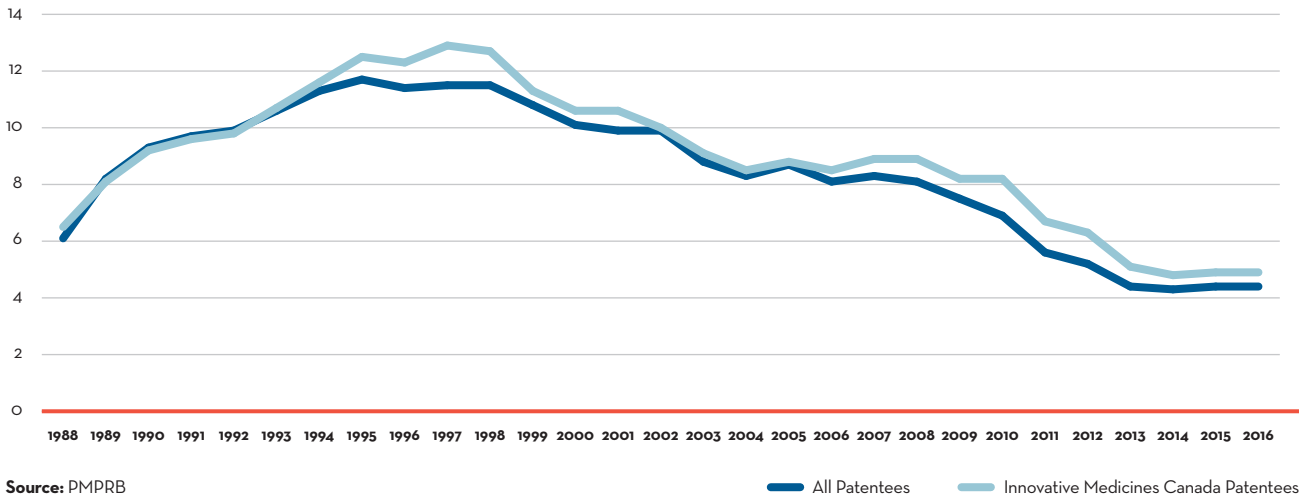
Table 18 and Figure 23 also provide ratios of R&D expenditures to sales revenues. It should be noted in this context that, with the adoption of the 1987 amendments to the Act, Innovative Medicines Canada made a public commitment to increase its members' annual R&D expenditures to 10% of sales revenues by 1996.[34] This level of R&D expenditure was reached by 1993, with the ratio exceeding 10% in some years.

The ratio of R&D expenditures to sales revenues among all patentees was 4.4% in 2016, unchanged from 4.4% in 2015. The overall R&D-to-sales ratio has been less than 10% for the past 16 consecutive years.

The corresponding R&D-to-sales ratio for members of Innovative Medicines Canada was 4.9% in 2016, unchanged from 4.9% in 2015.[35] The Innovative Medicines Canada ratio has been less than 10% for the past 14 consecutive years.

Table 23 in Appendix 3 provides details on the range of 2016 R&D-to-sales ratios. Of the 78 companies reporting in 2016, 89.7% had R&D-to-sales ratios below 10%.

Figure 23. R&D-to-Sales Ratio, Pharmaceutical Patentees, 1988–2016



Source: PMPRB

Table 18. Total R&D Expenditures and R&D-to-Sales Ratios of Reporting Companies, 1988–2016

Year	All patentees					Innovative Medicines Canada				R&D-to-sales ratio: all patentees (%)	R&D-to-sales ratio: Innovative Medicines Canada patentees (%)
	Number of companies reporting	R&D expenditures by all patentees ($millions)	Change from previous year (%)	Sales revenues ($millions)	Change from previous year (%)	R&D expenditures by Innovative Medicines Canada patentees ($millions)	Change from previous year (%)	Sales revenues by Innovative Medicines Canada patentees ($millions)	Change from previous year (%)		
2016	78	918.2	5.7	20,855.7	5.9	769.9	0.3	15,599.9	0.2	4.4	4.9
2015	77	869.1	9.7	19,693.3	6.7	767.4	7.8	15,565.1	4.7	4.4	4.9
2014	75	792.2	-0.8	18,455.1	1.0	711.7	2.0	14,861.1	9.2	4.3	4.8
2013	81	798.3	-14.7	18,268.1	1.4	697.5	-15.4	13,614.8	3.4	4.4	5.1
2012	85	936.1	-5.6	18,021.1	1.3	824.1	-8.6	13,162.8	-2.1	5.2	6.3
2011	79	991.7	-15.8	17,798.8	4.7	901.2	-9.9	13,446.1	10.7	5.6	6.7
2010	82	1,178.2	-7.4	17,000.0	-0.3	1,000.2	-11.7	12,149.0	-11.8	6.9	8.2

continued

Year	All patentees					Innovative Medicines Canada				R&D-to-sales ratio: all patentees (%)	R&D-to-sales ratio: Innovative Medicines Canada patentees (%)
	Number of companies reporting	R&D expenditures by all patentees ($millions)	Change from previous year (%)	Sales revenues ($millions)	Change from previous year (%)	R&D expenditures by Innovative Medicines Canada patentees ($millions)	Change from previous year (%)	Sales revenues by Innovative Medicines Canada patentees ($millions)	Change from previous year (%)		
2009	81	1,272.0	-2.9	17,051.9	4.5	1,132.9	-3.4	13,780.0	4.6	7.5	8.2
2008	82	1,310.7	-1.1	16,316.7	2.0	1,172.2	-1.0	13,178.2	-1.4	8.1	8.9
2007	82	1,325.0	9.5	15,991.0	7.3	1,184.4	24.8	13,359.8	20.0	8.3	8.9
2006	72	1,210.0	-1.9	14,902.0	4.7	949.0	-8.8	11,131.2	-5.8	8.1	8.5
2005	80	1,234.3	5.5	14,231.3	0.5	1,040.1	3.9	11,821.4	0.0	8.7	8.8
2004	84	1,170.0	-2.0	14,168.3	4.0	1,000.8	0.8	11,819.0	8.8	8.3	8.5
2003	83	1,194.3	-0.4	13,631.1	12.8	992.9	-3.6	10,865.7	5.2	8.8	9.1
2002	79	1,198.7	13.0	12,081.2	12.5	1,029.6	10.1	10,323.8	16.8	9.9	10.0
2001	74	1,060.1	12.6	10,732.1	15.3	935.2	14.7	8,835.4	14.3	9.9	10.6
2000	79	941.8	5.3	9,309.6	12.0	815.5	4.0	7,728.8	11.6	10.1	10.6
1999	78	894.6	12.0	8,315.5	19.2	784.3	9.9	6,923.4	22.8	10.8	11.3
1998	74	798.9	10.2	6,975.2	10.9	713.7	8.6	5,640.2	10.6	11.5	12.7
1997	75	725.1	9.0	6,288.4	7.4	657.4	10.3	5,098.2	4.9	11.5	12.9
1996	72	665.3	6.4	5,857.4	9.9	595.8	6.5	4,859.5	8.7	11.4	12.3
1995	71	625.5	11.5	5,330.2	7.5	559.5	9.8	4,468.8	1.4	11.7	12.5
1994	73	561.1	11.4	4,957.4	4.4	509.5	10.4	4,407.2	2.0	11.3	11.6
1993	70	503.5	22.1	4,747.6	14.0	461.4	24.0	4,321.4	14.4	10.6	10.7
1992	71	412.4	9.6	4,164.4	6.9	372.1	9.0	3,778.4	6.5	9.9	9.8
1991	65	376.4	23.2	3,894.8	18.1	341.4	24.7	3,546.9	19.5	9.7	9.6
1990	65	305.5	24.8	3,298.8	11.0	273.8	25.8	2,967.9	10.5	9.3	9.2
1989	66	244.8	47.4	2,973.0	9.4	217.6	34.7	2,685.5	7.3	8.2	8.1
1988	66	165.7	–	2,718.0	–	161.5	–	2,502.3	–	6.1	6.5

Source: PMPRB

CURRENT EXPENDITURES BY TYPE OF RESEARCH

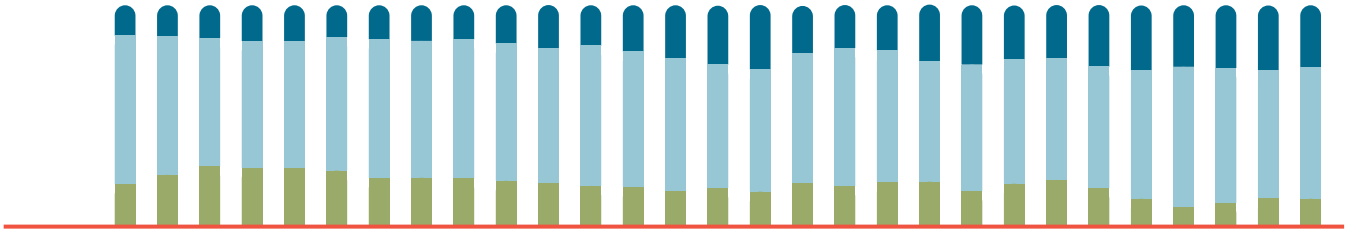
Table 19 and Figure 24 (as well as Figure 26 in Appendix 3) provide information on the allocation of 2016 current R&D expenditures[36] among basic and applied research and other qualifying R&D.[37] Patentees reported spending $105.9 million on basic research in 2016, representing 12.6% of current R&D expenditures and an increase of 3.6% over the previous year. Patentees reported spending $500.9 million on applied research, representing 59.5% of current R&D expenditures. Clinical trials accounted for 72.0% of applied research expenditures.

Table 19. Current R&D Expenditures by Type of Research, 2016 and 2015

Type of research	Expenditures: 2016 ($millions)	Share: 2016 (%)	Expenditures: 2015 ($millions)	Share: 2015 (%)	Annual change in expenditures (%)
Basic	**105.9**	**12.6**	**102.2**	**12.9**	**3.6**
Chemical	72.1	8.6	66.4	8.4	8.6
Biological	33.8	4.0	35.8	4.5	-5.6
Applied	**500.9**	**59.5**	**456.2**	**57.7**	**9.7**
Manufacturing process	79.7	9.5	58.0	7.3	36.7
Pre-clinical Trial I	37.2	4.4	40.4	5.1	-7.9
Pre-clinical Trial II	24.6	2.9	26.7	3.4	-7.9
Clinical Trial Phase I	49.4	5.9	25.1	3.2	96.8
Clinical Trial Phase II	68.1	8.1	67.1	8.5	1.5
Clinical Trial Phase III	241.9	28.8	238.9	30.2	1.3
Other qualifying R&D	**234.9**	**27.9**	**231.7**	**29.3**	**1.4**
Total	**841.7**	**100.0†**	**790.1**	**100.0†**	**6.5**

† Values in this column may not add due to rounding
Source: PMPRB

Figure 24. Current R&D Expenditures by Type of Research, 1988–2016



	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Basic	19.1	23.4	27.2	26.5	26.4	25.3	21.9	22.1	21.7	20.7	19.6	18.4	17.8	16.1	17.4	15.8	19.7	18.2	20.0	20.3	15.9	19.4	21.1	17.3	12.6	8.7	10.7	12.9	12.6
Applied	67.2	62.7	58.0	57.3	57.1	60.3	62.7	61.8	62.9	62.0	61.1	63.3	61.3	59.9	55.8	55.2	58.3	62.4	59.5	54.4	57.3	56.2	54.8	55.0	57.9	63.5	60.9	57.7	59.5
Other Qualifying	13.7	13.9	14.8	16.2	16.5	14.4	15.4	16.1	15.4	17.3	19.4	18.3	20.9	24.0	26.6	29.1	21.7	19.5	20.5	25.6	26.8	24.3	24.2	27.8	29.4	27.8	28.4	29.3	27.9

Source: PMPRB

CURRENT R&D EXPENDITURES BY PERFORMER

Patentees report expenditures on research they conduct themselves (intramural) and research performed by other establishments, such as universities, hospitals and other manufacturers (extramural). Table 20 shows that 46.9% of 2016 current research expenditures were intramural. Research performed by other companies on behalf of patentees was 25.4% of current expenditures, while research conducted in universities and hospitals accounted for 15.6%.

TOTAL R&D EXPENDITURES BY SOURCE OF FUNDS

Table 21 provides information on the sources of funds used by patentees to finance their R&D activity. Internal company funds remained by far the single largest source of funding in 2016, accounting for 92.4% of total expenditures. Funds received from government amounted to 0.6% of total expenditures.

CURRENT R&D EXPENDITURES BY REGION

Table 22 (as well as Table 25 and Table 26 in Appendix 3) show current R&D expenditures by region. As in previous years, current expenditures were heavily concentrated in Ontario and Quebec in 2016, with these provinces accounting for 81.5% of total expenditures. While current R&D expenditures increased at a year-over-year rate of 3.2% in Western Canada, they remained unchanged in Ontario and increased by 20.0% in Quebec.

Table 20. Current R&D Expenditures by R&D Performer, 2016 and 2015

R&D performer	Expenditures: 2016 ($millions)	Share: 2016 (%)	Expenditures: 2015($millions)	Share: 2015 (%)	Annual change in expenditures (%)
Intramural					
Patentees	394.9	46.9	390.0	49.4	1.3
Extramural					
Universities and hospitals	131.4	15.6	134.6	17.0	-2.4
Other companies	213.6	25.4	170.3	21.6	25.5
Others	101.8	12.1	95.2	12.1	6.9
Total*	**841.7**	**100.0**	**790.1**	**100.0**	**6.5**

* Values in this row may not add due to rounding
Source: PMPRB

Table 21. Total R&D Expenditures by Source of Funds, 2016 and 2015

Source of funds	Expenditures: 2016 ($millions)	Share: 2016 (%)	Expenditures: 2015 ($millions)	Share: 2015 (%)	Annual increase in expenditures (%)
Company funds	848.5	92.4	791.7	91.1	7.2
Federal/provincial governments	5.4	0.6	8.3	1.0	-35.0
Others	64.3	7.0	69.1	8.0	-7.0
Total*	**918.2**	**100.0**	**869.1**	**100.0**	**5.7**

* Values in this row may not add due to rounding
Source: PMPRB

Table 22. Current R&D Expenditures by Region, 2016 and 2015

Region	Expenditures: 2016 ($millions)	Share: 2016 (%)	Expenditures: 2015 ($millions)	Share: 2015 (%)	Annual change in expenditures (%)
Atlantic provinces	16.0	1.9	14.3	1.8	12.1
Quebec	272.6	32.4	227.1	28.7	20.0
Ontario	413.1	49.1	413.0	52.3	0.0
Western provinces	140.0	16.6	135.7	17.2	3.2
Territories	0.0	0.0	0.0	0.0	0.0
Total*	**841.7**	**100.0**	**790.1**	**100.0**	**6.5**

* Values in this row may not add due to rounding
Source: PMPRB

THE GLOBAL CONTEXT

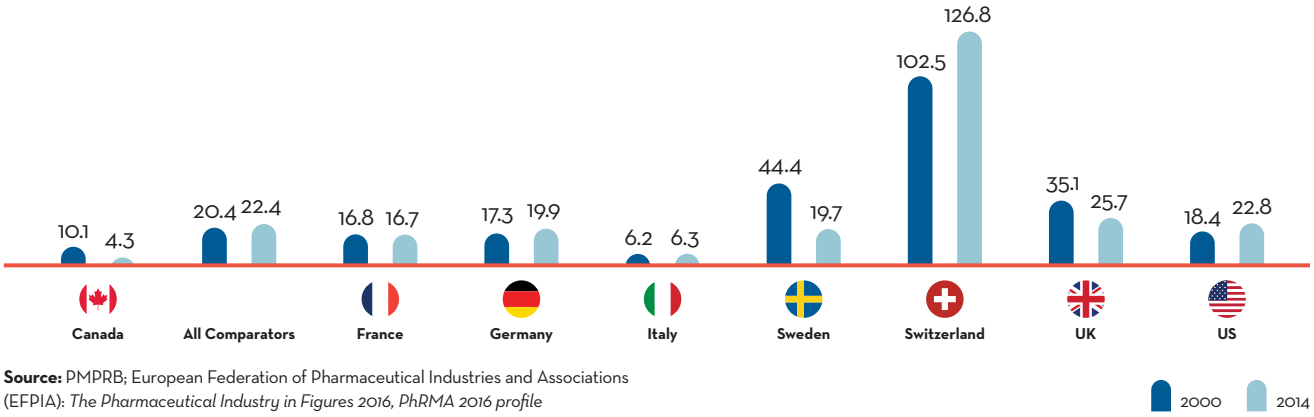
Figure 25 compares Canadian pharmaceutical R&D-to-sales ratios for the years 2000 and 2014 to those in the PMPRB's seven comparator countries.[38] Canada's ratio stood at 10.1% in 2000. Only Italy, at 6.2%, had a lower ratio in that year, while Switzerland had the highest ratio at 102.5%.

In 2014, Canada stood at the bottom of the range at 4.3%, with Italy second lowest at 6.3%. Ratios in all other comparator countries remained well above Canada's. The ratio obtained by aggregating R&D spending and sales across all seven comparator countries was 22.4%, more than five times Canada's.

The R&D-to-sales ratios represented in Figure 25 may be compared to the average bilateral price ratios reported in Table 11 (see *Comparison of Canadian Prices to Foreign Prices* section). Several comparator countries, which have patented drug prices that are, on average, substantially less than prices in Canada, have achieved R&D-to-sales ratios well above those in Canada.

As noted in previous years' reports, there are a multitude of factors that drive the location of pharmaceutical R&D. These include where companies can find the best science base at reasonable cost and ready access to a quality clinical trials infrastructure. Although price levels are often cited as an important policy lever for attracting R&D, the data has not supported this link domestically or internationally.

Figure 25. R&D-to-Sales Ratios, Canada and Comparator Countries



Source: PMPRB; European Federation of Pharmaceutical Industries and Associations (EFPIA): *The Pharmaceutical Industry in Figures 2016, PhRMA 2016 profile*

(Endnotes)

32 This is likely the situation for much of Canada's biotechnology sector. Note, however, that if a patentee commissions research from another company specializing in biotechnology research, the patentee should normally include this among the research expenditures that it reports to the PMPRB.

33 Budget 2012 proposed reductions to the Scientific Research and Experimental Development (SR&ED) tax credit and new restrictions on deductions. It also introduced new measures to support innovation and R&D. As per the Regulations, the PMPRB defines R&D based on the 1987 SR&ED definition.

34 As published in the Regulatory Impact Assessment Statement (RIAS) of the *Patented Medicines Regulations*, 1988, published in the *Canada Gazette*, Part II, Vol. 122, No. 20 – SOR/DORS/88-474.

35 The R&D-to-sales ratios presented in Table 18 include research expenditures funded by government grants. If the government-funded component is excluded, the ratios for all patentees and for the members of Innovative Medicines Canada in 2016 are 4.4% and 4.9%, respectively.

36 Current R&D expenditures consist of non-capital expenses directly related to research, including (a) wages and salaries; (b) direct material; (c) contractors and sub-contractors; (d) other direct costs such as factory overhead; (e) payments to designated institutions; (f) payments to granting councils; and (g) payments to other organizations. These elements are described in more detail in Form 3 (Revenues and Research and Development Expenditures) available from the PMPRB website. Current R&D expenditures accounted for 91.6% of total R&D expenditure in 2016, while capital equipment costs and allowable depreciation expenses made up 6.8% and 1.5%, respectively.

37 "Basic research" is defined as work that advances scientific knowledge without a specific application in mind. "Applied research" is directed toward a specific practical application, comprising research intended to improve manufacturing processes, pre-clinical trials and clinical trials. "Other qualifying research" includes drug regulation submissions, bioavailability studies and Phase IV clinical trials.

38 Sales in Figure 25 represent domestic sales and do not include exports.

APPENDIX 1: GLOSSARY

For more detailed information and definitions please refer to the *Patent Act*, the *Patented Medicines Regulations*, the PMPRB *Compendium of Policies, Guidelines and Procedures*, and the *Food and Drug Regulations*, or contact the PMPRB.

ACTIVE INGREDIENT: Chemical or biological substance responsible for the claimed pharmacologic effect of a drug product.

ADVANCE RULING CERTIFICATE (ARC): A non-binding advance ruling certificate may be issued pursuant to subsection 98(4) of the *Patent Act* at the request of a patentee when the Board is satisfied that the price or proposed price of the medicine would not exceed the maximum non-excessive price under the Board's Guidelines.

ATC: Anatomical Therapeutic Chemical (ATC) classification system, developed and maintained by the World Health Organization (WHO) Collaborating Centre for Drug Statistics Methodology, divides drugs into different groups according to their site of action and therapeutic and chemical characteristics. This system is used by the PMPRB as a guide for selecting comparable medicines for purposes of price review.

DEDICATION OF PATENT: A practice whereby a patentee notifies the Commissioner of Patents that it has surrendered its rights and entitlements flowing from the patent for the benefit of the public to use and enjoy. NB: As of January 30, 1995, the Board does not recognize dedication of patent as a means to remove the medicine from its jurisdiction.

DRUG IDENTIFICATION NUMBER (DIN): A registration number (drug identification number) that the Health Products and Food Branch of Health Canada assigns to each prescription and non-prescription drug product marketed under the *Food and Drug Regulations*. A DIN uniquely identifies the following product characteristics: manufacturer; product name; active ingredient(s); strength(s) of active ingredient(s); pharmaceutical dosage form; route of administration.

DRUG PRODUCT: A particular presentation of a medicine characterized by its pharmaceutical dosage form and the strength of the active ingredient(s).

FAILURE TO FILE: The complete or partial failure of a patentee to comply with regulatory filing requirements pursuant to the *Patent Act* and the *Patented Medicines Regulations*.

FAILURE TO REPORT: The complete failure of a patentee to have reported a patented drug product being sold in accordance with regulatory filing requirements pursuant to the *Patent Act* and the *Patented Medicines Regulations*.

GENERIC PRODUCT: A drug product with the same active ingredient, strength and dosage form of a brand name drug product.

LICENSE, VOLUNTARY: A contractual agreement between a patent holder and a licensee under which the licensee is entitled to enjoy the benefit of the patent or to exercise any rights in relation to the patent for some consideration (i.e., royalties in the form of a share of the licensee's sales).

MEDICINE: Any substance or mixture of substances made by any means, whether produced biologically, chemically, or otherwise, that is applied or administered in vivo in humans or in animals to aid in the diagnosis, treatment, mitigation or

prevention of disease, symptoms, disorders, abnormal physical states, or modifying organic functions in humans and or animals, however administered. For greater certainty, this definition includes vaccines, topical preparations, anaesthetics and diagnostic products used in vivo, regardless of delivery mechanism (e.g., transdermal, capsule form, injectable, inhaler, etc.). This definition excludes medical devices, in vitro diagnostic products and disinfectants that are not used in vivo.

NOTICE OF COMPLIANCE (NOC): Means a notice issued under section C.08.004 or C.08.004.01 of the *Food and Drug Regulations*. The issuance of an NOC indicates that a drug product meets the required Health Canada standards for use in humans or animals and that the product is approved for sale in Canada.

PATENT: An instrument issued by the Commissioner of Patents in the form of letters patent for an invention that provides its holder with a monopoly limited in time, for the claims made within the patent. A patent gives its holder and its legal representatives, the exclusive right of making, constructing and using the invention and selling it to others to be used.

PATENTED MEDICINE PRICE INDEX (PMPI): The PMPI was developed by the PMPRB as a measure of average year-over-year change in the transaction prices of patented drug products sold in Canada, based on the price and sales information reported by patentees.

PATENTEE: As defined by subsection 79(1) of the *Patent Act*, "the person for the time being entitled to the benefit of the patent for that invention and includes, where any other person is entitled to exercise any rights in relation to that patent other than under a license continued by subsection 11(1) of the *Patent Act Amendment Act, 1992,* that other person in respect of those rights."

PENDING PATENT: An application for a patent that has not yet been issued.

PMPRB7: France, Germany, Italy, Sweden, Switzerland, the United Kingdom and the United States.

RESEARCH AND DEVELOPMENT (R&D): Basic or applied research for the purpose of creating new, or improving existing, materials, devices, products or processes (e.g., manufacturing processes).

RESEARCH AND DEVELOPMENT—APPLIED RESEARCH: R&D directed toward a specific practical application, comprising research intended to improve manufacturing processes, pre-clinical trials and clinical trials.

RESEARCH AND DEVELOPMENT—BASIC RESEARCH: R&D defined as work that advances scientific knowledge without a specific application in mind.

RESEARCH AND DEVELOPMENT—OTHER QUALIFYING: Includes eligible research and development expenditures that cannot be classified into any of the preceding categories of "type of research and development". It includes drug regulation submissions, bioavailability studies and Phase IV clinical trials.

RESEARCH AND DEVELOPMENT EXPENDITURES: For the purposes of the *Patented Medicines Regulations*, in particular Sections 5 and 6, research and development includes activities for which expenditures would have qualified for the investment tax credit for scientific research and experimental development under the *Income Tax Act* as it read on December 1, 1987.

RESEARCH AND DEVELOPMENT EXPENDITURES–CURRENT: Consist of the following non-capital expenses that are directly related to research work: (a) wages and salaries, (b) direct material, (c) contractors and subcontractors, (d) other direct costs such as factory overhead, (e) payments to designated institutions, (f) payments to granting councils, and (g) payments to other organizations. These elements are described in greater detail in the *Patentees ' Guide to Reporting*—Form 3, available from the PMPRB Website under Regulatory Filings.

SPECIAL ACCESS PROGRAMME (SAP): A program operated by Health Canada to give practitioners access to drugs that are not approved or otherwise available for sale in Canada.

VOLUNTARY COMPLIANCE UNDERTAKING (VCU): A written undertaking by a patentee to adjust its price to conform to the Board ' s Guidelines. A VCU represents a compromise between the PMPRB and the patentee as a result of negotiations between the parties geared towards a satisfactory resolution of an investigation initiated by Board Staff as per the Guidelines. A VCU takes into account the specific facts and underlying context of a particular case. As such, VCUs are not intended to have precedential value. The Chairperson may accept a VCU in lieu of issuing a Notice of Hearing if it is in the public interest. A VCU can also be submitted following the issuance of a Notice of Hearing. A VCU submitted at this point must be approved by the Board Hearing Panel struck to hear the matter. The Board reports publicly on all VCUs accepted by the Chairperson or the Board.

APPENDIX 2: PATENTED DRUG PRODUCTS FIRST REPORTED TO THE PMPRB IN 2016

	Brand Name	Company	DIN	Status	Level of therapeutic improvement/ category*
1	AFINITOR – 7.5 mg/tablet	Novartis Pharmaceuticals Canada Inc.	02450267	Does Not Trigger Investigation	SN
2	ALPROLIX – 500 IU/vial	Biogen Canada Inc.	02422913	Under Review	SN
3	ALPROLIX – 1000 IU/vial	Biogen Canada Inc.	02422921	Under Review	SN
4	ALPROLIX – 2000 IU/vial	Biogen Canada Inc.	02422948	Under Review	SN
5	ALPROLIX – 3000 IU/vial	Biogen Canada Inc.	02422956	Under Review	SN
6	ARNUITY ELLIPTA – 100 mcg/dose	GlaxoSmithKline Inc.	02446561	Within Guidelines	SN
7	ARNUITY ELLIPTA – 200 mcg/dose	GlaxoSmithKline Inc.	02446588	Within Guidelines	SN
8	BELKYRA – 10 mg/milliliter	Allergan Inc.	02443910	Does Not Trigger Investigation	B
9	BETEFLAM – 2.25 mg/patch	Cipher Pharmaceuticals Inc.	02449773	Subject to Investigation	SN
10	BLINCYTO – 38.5 mcg/vial	Amgen Canada Inc.	02450283	Within Guidelines	SN
11	BRENZYS – 50 mg/milliliter	Merck Canada Inc.	02455323	Within Guidelines	SN
12	BRENZYS – 50 mg/milliliter	Merck Canada Inc.	02455331	Within Guidelines	SN
13	BRIDION – 100 mg/milliliter	Merck Canada Inc.	02451816	Subject to Investigation	MI-P
14	BRILINTA – 60 mg/tablet	AstraZeneca Canada Inc.	02455005	Within Guidelines	SN
15	BRIVLERA – 10 mg/tablet	UCB Canada Inc.	02452936	Within Guidelines	SN
16	BRIVLERA – 25 mg/tablet	UCB Canada Inc.	02452944	Within Guidelines	SN
17	BRIVLERA – 50 mg/tablet	UCB Canada Inc.	02452952	Within Guidelines	SN
18	BRIVLERA – 75 mg/tablet	UCB Canada Inc.	02452960	Within Guidelines	SN
19	BRIVLERA – 100 mg/tablet	UCB Canada Inc.	02452979	Within Guidelines	SN
20	BUTRANS – 15 mg/patch	Purdue Pharma	02450771	Under Review	SN
21	BYDUREON – 2 mg/dose	AstraZeneca Canada Inc.	02448610	Within Guidelines	SN

continued

	Brand Name	Company	DIN	Status	Level of therapeutic improvement/ category*
22	COPAXONE – 40 mg/milliliter	Teva Canada Innovation G.P.-S.E.N.C.	02456915	Under Review	MI-S
23	CORTIMENT – 9 mg/tablet	Ferring Inc.	02455889	Under Review	SN
24	COTELLIC – 20 mg/tablet	Hoffmann-La Roche Limited	02452340	Subject to Investigation	SN
25	DESCOVY 200/10 – 210 mg/tablet	Gilead Sciences Canada Inc.	02454416	Under Review	SN
26	DESCOVY 200/25 – 225 mg/tablet	Gilead Sciences Canada Inc.	02454424	Under Review	SN
27	ELOCTATE – 250 IU/vial	Biogen Canada Inc.	02430290	Under Review	SN
28	ELOCTATE – 500 IU/vial	Biogen Canada Inc.	02430304	Under Review	SN
29	ELOCTATE – 750 IU/vial	Biogen Canada Inc.	02430312	Under Review	SN
30	ELOCTATE – 1000 IU/vial	Biogen Canada Inc.	02430320	Under Review	SN
31	ELOCTATE – 1500 IU/vial	Biogen Canada Inc.	02430339	Under Review	SN
32	ELOCTATE – 2000 IU/vial	Biogen Canada Inc.	02430347	Under Review	SN
33	ELOCTATE – 3000 IU/vial	Biogen Canada Inc.	02430355	Under Review	SN
34	ENSTILAR – 0.55 MG/1 gram	Leo Pharma Inc.	02457393	Under Review	SN
35	EPCLUSA 400/100 – 500 mg/tablet	Gilead Sciences Canada Inc.	02456370	Within Guidelines	SN
36	EVOTAZ – 450 mg/tablet	Bristol-Myers Squibb Canada Co.	02446731	Within Guidelines	SN
37	FETZIMA – 80 mg/capsule	Allergan Inc.	02440997	Within Guidelines	SN
38	FETZIMA – 120 mg/capsule	Allergan Inc.	02441004	Within Guidelines	SN
39	GENVOYA 200/150/150/10 – 510 mg/tablet	Gilead Sciences Canada Inc.	02449498	Subject to Investigation	SN
40	HUMIRA – 40 mg/syringe	AbbVie	02458349	Under Review	SN
41	HUMIRA – 40 mg/pen	AbbVie	02458357	Under Review	SN
42	IBRANCE – 75 mg/capsule	Pfizer Canada Inc.	02453150	Within Guidelines	SN
43	IBRANCE – 100 mg/capsule	Pfizer Canada Inc.	02453169	Within Guidelines	SN
44	IBRANCE – 125 mg/capsule	Pfizer Canada Inc.	02453177	Within Guidelines	SN
45	ICLUSIG – 45 mg/tablet	Paladin Labs Inc.	02437341	Within Guidelines	SN
46	INVEGA TRINZA – 175 mg/syringe	Janssen Inc.	02455943	Within Guidelines	SN
47	INVEGA TRINZA – 263 mg/syringe	Janssen Inc.	02455986	Within Guidelines	SN
48	INVEGA TRINZA – 350 mg/syringe	Janssen Inc.	02455994	Within Guidelines	SN
49	INVEGA TRINZA – 525 mg/syringe	Janssen Inc.	02456001	Within Guidelines	SN
50	INVOKAMET 150/1000 – 1150 mg/tablet	Janssen Inc.	02455455	Under Review	SN
51	INVOKAMET 150/500 – 650 mg/tablet	Janssen Inc.	02455439	Under Review	SN
52	INVOKAMET 150/850 – 1000 mg/tablet	Janssen Inc.	02455447	Under Review	SN
53	INVOKAMET 50/1000 – 1050 mg/tablet	Janssen Inc.	02455420	Under Review	SN
54	INVOKAMET 50/500 – 550 mg/tablet	Janssen Inc.	02455404	Under Review	SN
55	INVOKAMET 50/850 – 900 mg/tablet	Janssen Inc.	02455412	Under Review	SN
56	JADENU – 90 mg/tablet	Novartis Pharmaceuticals Canada Inc.	02452219	Does Not Trigger Investigation	SN
57	JADENU – 180 mg/tablet	Novartis Pharmaceuticals Canada Inc.	02452227	Does Not Trigger Investigation	SN
58	JADENU – 360 mg/tablet	Novartis Pharmaceuticals Canada Inc.	02452235	Does Not Trigger Investigation	SN

continued

	Brand Name	Company	DIN	Status	Level of therapeutic improvement/ category*
59	KOVALTRY – 1 N.A./unit	Bayer Inc.	02451441	Under Review	SN
60	KOVALTRY – 1 N.A./unit	Bayer Inc.	02451468	Under Review	SN
61	KOVALTRY – 1 N.A./unit	Bayer Inc.	02451476	Under Review	SN
62	KOVALTRY – 1 N.A./unit	Bayer Inc.	02451484	Under Review	SN
63	KOVALTRY – 1 N.A./unit	Bayer Inc.	02451492	Under Review	SN
64	KYPROLIS – 60 mg/vial	Amgen Canada Inc.	02451034	Does Not Trigger Investigation	SN
65	LENVIMA – 10 mg/day	Eisai Limited	02450321	Under Review	SN
66	LENVIMA 10/10 – 20 mg/day	Eisai Limited	02450305	Within Guidelines	MI-P
67	LENVIMA 10/10/4 – 24 mg/day	Eisai Limited	02450291	Within Guidelines	MI-P
68	LENVIMA 10/4 – 14 mg/day	Eisai Limited	02450313	Within Guidelines	MI-P
69	LYNPARZA – 50 mg/capsule	AstraZeneca Canada Inc.	02454408	Subject to Investigation	MI-P
70	MENJUGATE LIQUID – 1 N.A./dose	GlaxoSmithKline Inc.	02440709	Under Review	SN
71	NATESTO – 5.5 mg/actuation	Acerus Pharmaceuticals SRL	02450550	Does Not Trigger Investigation	SN
72	NEUPOGEN – 0.6 mg/milliliter	Amgen Canada Inc.	02420104	Within Guidelines	SN
73	NEUPOGEN – 0.6 mg/milliliter	Amgen Canada Inc.	02420112	Within Guidelines	SN
74	NINLARO – 2.3 mg/capsule	Takeda Canada Inc.	02456796	Under Review	SN
75	NINLARO – 3 mg/capsule	Takeda Canada Inc.	02456818	Under Review	SN
76	NINLARO – 4 mg/capsule	Takeda Canada Inc.	02456826	Under Review	SN
77	NUWIQ – 250 IU/vial	Octapharma Canada Inc.	02432951	Does Not Trigger Investigation	SN
78	NUWIQ – 500 IU/vial	Octapharma Canada Inc.	02432978	Does Not Trigger Investigation	SN
79	NUWIQ – 1000 IU/vial	Octapharma Canada Inc.	02432986	Under Review	SN
80	NUWIQ – 2000 IU/vial	Octapharma Canada Inc.	02432994	Under Review	SN
81	ORKAMBI 200/125 – 325 mg/tablet	Vertex Pharmaceuticals Canada Inc.	02451379	Within Guidelines	MI-P
82	PRECEDEX – 4 mcg/milliliter	Hospira Healthcare Corporation (Canada)	02437147	Within Guidelines	SN
83	PREGVIT – 1 N.A./tablet	Duchesnay Inc.	02451573	Under Review	SN
84	PREGVIT FOLIC 5 – 1 N.A./tablet	Duchesnay Inc.	02451581	Under Review	SN
85	RITUXAN SC – 120 mg/milliliter	Hoffmann-La Roche Limited	02457350	Within Guidelines	SN
86	SIGNIFOR LAR – 20 mg/vial	Novartis Pharmaceuticals Canada Inc.	02437252	Within Guidelines	SN
87	SOMAVERT – 25 mg/vial	Pfizer Canada Inc.	02448831	Within Guidelines	SN
88	SOMAVERT – 30 mg/vial	Pfizer Canada Inc.	02448858	Within Guidelines	SN
89	STRENSIQ – 18 mg/milliliter	Alexion Pharmaceuticals Inc.	02444615	Under Review	B
90	STRENSIQ – 80 mg/milliliter	Alexion Pharmaceuticals Inc.	02444658	Under Review	B
91	SUNVEPRA – 100 mg/capsule	Bristol-Myers Squibb Canada Co.	02452294	Under Review	SN
92	SYNAGIS – 100 mg/vial	AbbVie	02438364	Under Review	SN
93	SYNAGIS – 50 mg/vial	AbbVie	02438372	Under Review	SN

continued

	Brand Name	Company	DIN	Status	Level of therapeutic improvement/ category*
94	SYNJARDY 12.5/1000 – 1012.5 mg/tablet	Boehringer Ingelheim (Canada) Ltd.	02456621	Under Review	**SN**
95	SYNJARDY 12.5/500 – 512.5 mg/tablet	Boehringer Ingelheim (Canada) Ltd.	02456605	Under Review	**SN**
96	SYNJARDY 12.5/850 – 862.5 mg/tablet	Boehringer Ingelheim (Canada) Ltd.	02456613	Under Review	**SN**
97	SYNJARDY 5/1000 – 1005 mg/tablet	Boehringer Ingelheim (Canada) Ltd.	02456591	Under Review	**SN**
98	SYNJARDY 5/500 – 505 mg/tablet	Boehringer Ingelheim (Canada) Ltd.	02456575	Under Review	**SN**
99	SYNJARDY 5/850 – 855 mg/tablet	Boehringer Ingelheim (Canada) Ltd.	02456583	Under Review	**SN**
100	TACTUPUMP FORTE – 70 g/pump	Galderma Canada Inc.	02446235	Under Review	**SN**
101	TAGRISSO – 40 mg/tablet	AstraZeneca Canada Inc.	02456214	Within Guidelines	**MI-P**
102	TAGRISSO – 80 mg/tablet	AstraZeneca Canada Inc.	02456222	Within Guidelines	**MI-P**
103	TALTZ – 80 mg/milliliter	Eli Lilly Canada Inc.	02455102	Under Review	**SN**
104	TALTZ – 80 mg/milliliter	Eli Lilly Canada Inc.	02455110	Under Review	**SN**
105	TIVICAY – 50 mg/tablet	ViiV Healthcare ULC	02414945	Within Guidelines	**SN**
106	TRANSLARNA – 1000 mg/pouch	PTC Therapeutics International Limited		Within Guidelines	**SN**
107	TRULICITY – 0.75 mg/pen	Eli Lilly Canada Inc.	02448599	Within Guidelines	**SN**
108	UPTRAVI – 200 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451158	Subject to Investigation	**SN**
109	UPTRAVI – 400 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451166	Does Not Trigger Investigation	**SN**
110	UPTRAVI – 600 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451174	Within Guidelines	**SN**
111	UPTRAVI – 800 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451182	Subject to Investigation	**SN**
112	UPTRAVI – 1000 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451190	Does Not Trigger Investigation	**SN**
113	UPTRAVI – 1200 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451204	Within Guidelines	**SN**
114	UPTRAVI – 1400 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451212	Does Not Trigger Investigation	**SN**
115	UPTRAVI – 1600 mcg/tablet	Actelion Pharmaceuticals Canada Inc.	02451220	Subject to Investigation	**SN**
116	VENCLEXTA – 10 mg/tablet	AbbVie	02458039	Under Review	**SN**
117	VENCLEXTA – 50 mg/tablet	AbbVie	02458047	Under Review	**SN**
118	VENCLEXTA – 100 mg/tablet	AbbVie	02458055	Under Review	**SN**
119	VENCLEXTA 10/50/100 – 1 N.A./kit	AbbVie	02458063	Under Review	**SN**
120	VIACORAM 14/10 – 24 mg/tablet	Servier Canada Inc.	02451557	Within Guidelines	**SN**
121	VIACORAM 3.5/2.5 – 6 mg/tablet	Servier Canada Inc.	02451530	Within Guidelines	**SN**
122	VIACORAM 7/5 – 12 mg/tablet	Servier Canada Inc.	02451549	Within Guidelines	**SN**
123	VIBATIV – 750 mg/vial	Pendopharm, Division of Pharmascience Inc.	02330725	Subject to Investigation	**SN**
124	XIGDUO 5/1000 – 1005 mg/tablet	AstraZeneca Canada Inc.	02449943	Subject to Investigation	**SN**
125	XIGDUO 5/850 – 855 mg/tablet	AstraZeneca Canada Inc.	02449935	Subject to Investigation	**SN**

continued

	Brand Name	Company	DIN	Status	Level of therapeutic improvement/ category*
126	ZEPATIER 50/100 – 150 mg/tablet	Merck Canada Inc.	02451131	Subject to Investigation	**SN**
127	ZERBAXA 1000/500 – 1500 mg/vial	Merck Canada Inc.	02446901	Under Review	**SN**
128	ZYTIGA – 500 mg/tablet	Janssen Inc.	02457113	Does Not Trigger Investigation	**SN**

* Sold after implementation of new Guidelines in 2010:

SN Slight or No Improvement
MI-S Moderate Improvement – Secondary
MI-P Moderate Improvement – Primary
SI Substantial Improvement
B Breakthrough

Sold prior to implementation of new Guidelines in 2010:

Category 1 An existing or comparable dosage form of an existing medicine
Category 2 A non-comparable dosage form of an existing medicine, or the first DIN of a new chemical entity that is a breakthrough or provides a substantial improvement over comparable existing DINs
Category 3 A non-comparable dosage form of an existing medicine, or the first DIN of a new chemical entity that provides moderate, little or no therapeutic advantage over comparable existing DINs

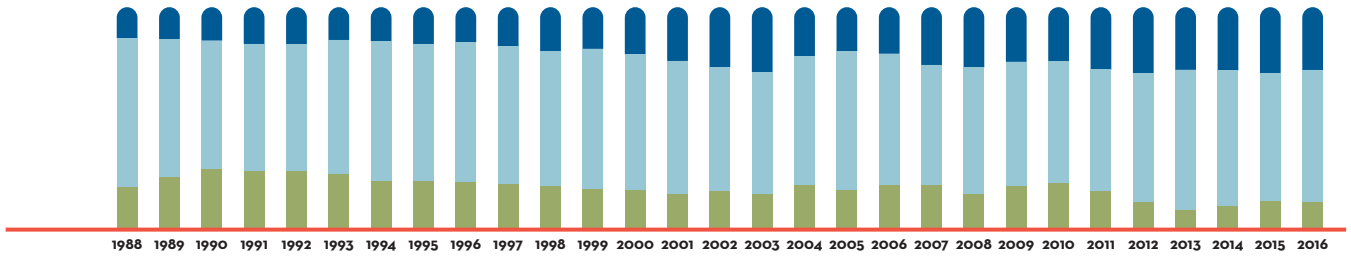
APPENDIX 3: RESEARCH AND DEVELOPMENT

Table 23. Range of R&D-to-Sales Ratios by Number of Reporting Companies and Total Sales Revenue

Range: R&D-to-sales ratio	Number of reporting companies: 2016	Sales revenues: 2016 ($millions)	Share: 2016 (%)	Number of reporting companies: 2015	Sales revenues: 2015 ($millions)	Share: 2015 (%)
0%	30	2,204.5	10.6	32	1,999.9	10.2
≤ 10%	40	16,791.7	80.5	38	15,767.8	80.1
> 10%	8	1,859.5	8.9	7	1,925.6	9.8
Total	**78**	**20,855.7**	**100.0†**	**77**	**19,693.3**	**100.0†**

' Values in this column may not add to 100.0 due to rounding
Source: PMPRB

Figure 26. Current R&D Expenditures ($millions) by Type of Research, 1988–2016



	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Basic	30.3	53.5	78.3	94.2	103.7	120.7	117.4	132.0	136.6	140.4	146.8	155.9	159.1	163.1	198.6	180.3	221.7	215.1	232.4	259.0	200.2	237.1	235.9	164.9	114.6	67.6	81.8	102.2	105.9
Applied	106.6	143.1	167.2	203.5	224.1	290.9	336.5	369.3	369.4	421.3	458.0	535.2	547.2	604.8	637.0	631.5	658.3	737.5	689.6	688.2	723.2	685.3	613.4	525.1	525.5	492.2	467.4	456.2	500.9
Other Qualifying	21.7	31.8	42.8	57.6	64.9	68.8	80.8	96.5	97.1	117.5	145.3	154.7	187.0	242.6	304.4	332.6	244.2	230.1	237.4	326.8	337.9	296.8	270.8	265.2	266.9	215.0	217.8	231.7	234.9

Source: PMPRB

Table 24. Ratios of R&D Expenditures to Sales Revenue by Reporting Patentee[1], 2016 and 2015

Company	R&D-to-sales ratio (%) 2016	R&D-to-sales ratio (%) 2015	MIP-to-Cdn Price Ratio (%) – 5 country limit (List price in Canada compared to International list price)	Canadian share of sales to PMPRB7 (2016)	Canadian share of sales to OECD (2016)
AbbVie Corporation.[2, 3, 4]	1.7	3.0	100	2.7	2.3
Acerus Pharmaceuticals. [5]	2.2				
Actelion Pharmaceuticals Canada Inc.[2, 4]	3.6	2.6	117	3.8	2.4
Alcon Canada Inc.	0.9	0.6	72		
Alexion Pharmaceuticals Inc.[3]	0.0	0.0	93		
Allergan Inc.	1.2	2.4	83	2.5	2.3
Amgen Canada Inc.[2, 3]	4.7	5.3	73	2.8	2.6
Aspen Pharma care Canada Inc. [5]	0.0		66	1.8	0.5
Aspri Pharma Canada Inc.	0.0	0.0			
Astellas Pharma Canada Inc.[2, 6]	2.0	3.6	345	2.5	1.6
AstraZeneca Canada Inc.[2, 3]	6.6	4.9	86	3.4	2.6
Baxalta Canada Corp.	0.0	0.0			
Baxter Corporation	0.0	0.0	100	0.6	0.4
Bayer Inc.[2]	5.9	5.5	97	9.1	5.1
BGP Pharma ULC. [10]	0.0	0.0	54		
Biogen Idec Canada Inc.[3]	10.2	10.8	100	1.5	1.4
BioMarin Canada Inc.[3]	4.5	47.0	111		
Biovitrum AB	0.0	0.0	93	2.7	1.9
BioSyent Pharma Inc.	0.0	0.0			
Boehringer Ingelheim (Canada) Ltd.[2]	5.0	5.5	105	2.9	2.1
Bracco Diagnostics Canada Inc.	0.0	0.0		0	0.004
Bristol-Myers Squibb Canada[2]	13.6	10.8	122	2.7	2.2
Celgene Inc.[3]	1.5	1.6	99	0.4	0.3
Cipher Pharmaceuticals Inc. [5]	0.0				
Correvio (UK) Ltd. (Iroko International LP)	0.0	0.0	83		
CSL Behring Canada Inc.	0.2	0.2			
Duchesnay Inc.	2.5	14.3		16.5	14.1
Eisai Limited.[3]	8.9	1.2	107	0.7	0.3
Eli Lilly Canada Inc. (includes Provel Animal Health Division)[2, 3]	6.7	3.3	85	2.2	1.8
EMD Serono Canada Inc.[2]	0.0	0.0	73		
Ferring Pharmaceuticals Inc.[2]	0.0	0.0	90	3.4	2.5
Galderma Canada Inc.	0.0	0.0	53		
Gilead Sciences Canada, Inc.[2]	16.4	16.2	103	2.3	1.8
GlaxoSmithKline Inc.[2]	5.6	5.8	76	3.4	2.6

continued

Company	R&D-to-sales ratio (%) 2016	R&D-to-sales ratio (%) 2015	MIP-to-Cdn Price Ratio (%) – 5 country limit (List price in Canada compared to International list price)	Canadian share of sales to PMPRB7 (2016)	Canadian share of sales to OECD (2016)
Grifols Canada Ltd. (Talecris Biotherapeutics Ltd.)[3]	0.0	0.0		0.01	0.007
Hoffmann-La Roche Ltd. Canada[2, 3]	5.6	5.1	85	2.7	2.1
Hospira Healthcare Corp.	0.0	0.0	76		
Ipsen Biopharmaceuticals Inc.[3, 5]	0.1		95	0.2	0.1
Janssen Inc.[2, 3]	3.6	3.4	97	7.4	6.0
Jazz Pharmaceuticals [11]	16.5	1.4	202	0.02	0.023
Johnson & Johnson Inc.	0.0	0.0			
Johnson & Johnson Medical Products	0.3	0.0			
Lantheus MI Canada Inc.	0.0	0.0			
LEO Pharma Inc.[2]	0.1	1.6	30	11.0	7.9
Lundbeck Canada Inc.	0.0	2.0	82	7.1	5.6
Lupin Pharma Canada Limited	0.0	0.4	103	0.07	0.06
McNeil Consumer Healthcare Canada	2.7	3.8			
Meda Pharmaceuticals Ltd.	0.0	0.0	30		
Medexus Inc. [5]	0.0				
Merck Canada Inc.[2, 3]	2.9	2.2	85	3.2	2.5
Merus Labs	0.0	0.0		29.1	16.5
Merz Pharma Canada Ltd.	2.0	1.3	90	1.4	1.1
Novartis Pharmaceuticals Canada Inc.[2, 3]	3.6	3.9	87	5.6	4.0
Novo Nordisk Canada Inc.[2, 3]	1.1	2.0	88	1.8	1.6
Octapharma Canada Inc.	6.6	0.1			
Otsuka Canada Pharmaceutical Inc. (OCPI)[2]	1.3	4.5	110	1.1	0.5
Paladin Labs Inc.[2]	0.2	0.2	57		
Pfizer Canada Inc.[2, 3]	1.0	0.9	95	2.8	2.1
Pharmascience Inc.[5]	8.4				
Purdue Pharma[2]	4.8	3.9	159		
PTC Therapeutics International Ltd.	130.5	0.0			
Ranbaxy Pharmaceuticals Canada Inc.	0.0	0.0			
Sanofi Canada Inc.[2, 3, 8]	1.6	2.1	82	1.9	1.5
Sanofi Pasteur Ltd.[2, 3, 7]	68.0	80.1			
Seattle Genetics Inc.	9.8	7.2	95		
Servier Canada Inc.[2]	2.1	2.6		14.6	8.7
Shire Canada Inc.[2, 3]	0.0	0.0	100	1.9	1.7
Shire Human Genetic Therapies[2, 3]	0.0	0.0	105		
Sunovion Pharmaceuticals Canada Inc.[2]	0.0	0.0	100		

continued

Company	R&D-to-sales ratio (%) 2016	R&D-to-sales ratio (%) 2015	MIP-to-Cdn Price Ratio (%) – 5 country limit (List price in Canada compared to International list price)	Canadian share of sales to PMPRB7 (2016)	Canadian share of sales to OECD (2016)
Takeda Canada Inc.[2,3]	0.0	0.0	83	2.8	1.5
Theratechnologic Inc. [2]	0.0	0.0			
Teva Canada Innovation[3]	0.2	0.1	102		
Tribute Pharma Canada Inc.	0.0	0.0			
UCB Canada Inc.[3]	16.9	1.0	94	1.4	1.1
Valeant Canada Ltd.[3,9]	3.1	5.0	60	2.9	2.6
Valneva Austria GmbH.[3,5]	0.0		63	80.8	41.4
Vertex Pharma Canada Inc. [3]	47.5	72.5	112		
VIIV Healthcare ULC.[2]	0.0	0.0	111		

[1] To avoid double counting of sales revenues, revenues from royalties are included in calculating each company's ratio but not included in calculating industry-wide ratios. Federal and provincial government grants are subtracted from the R&D expenditure in calculating individual R&D-to-sales ratios but are included in calculating industry-wide ratios. Differences between the list of firms filing data on prices and those filing R&D data are due to differences in reporting practices of patentees and their affiliates or licensees. Note as well that some veterinary patentees (i.e., those without revenue from sales of products for human use) are required to file information on R&D expenditure but not price and sales information.

[2] Member of Innovative Medicines Canada.

[3] Member of BIOTECanada.

[4] Spin-off of Abbott's proprietary products division into a separate legal entity effective Oct. 31, 2012.

[5] Not a patentee in 2015.

[6] Formerly known as Fujisawa Canada Inc.

[7] Formerly known as Aventis Pasteur Ltd.

[8] Formerly known as Aventis Pharma Inc.

[9] Formerly known as ICN Canada Ltd.

[10] "BGP Pharma ULC" to house the former "Abbott" and "Fournier" pharmaceutical brands in Canada.

[11] Did not file in 2015.

Table 25. Current R&D Expenditures by Province/Territory, 2016

Province	Expenditures: All patentees ($thousands)	Regional share (%)	Expenditures: Innovative Medicines Canada ($thousands)	Regional share (%)
Newfoundland	3,934.16	0.468	2,765.42	0.396
Prince Edward Island	1.20	0.000	1.20	0.000
Nova Scotia	8,435.37	1.002	7,313.19	1.047
New Brunswick	3,601.73	0.428	3,006.98	0.431
Quebec	272,567.83	32.384	189,378.29	27.125
Ontario	413,077.27	49.079	367,247.73	52.601
Manitoba	5,505.25	0.654	4,322.24	0.619
Saskatchewan	2,123.68	0.252	1,242.42	0.178
Alberta	92,530.46	10.994	88,201.18	12.633
British Columbia	39,885.44	4.739	34,692.47	4.969
Territories	0	0.000	0	0.000
Canada	**841,662.41†**	**100.0†**	**698,171.13†**	**100.0†**

† Values in this row may not add due to rounding.
Source: PMPRB

Table 26. Current R&D Expenditures by Performer and Province/Territory, 2016

Province		Patentees	Other Companies	University	Hospitals	Others
Newfoundland	$000	1,258.32	1,373.54	472.67	410.15	419.49
	%	32.0	34.9	12.0	10.4	10.6
Prince Edward Island	$000	0.00	0.00	0.00	0.00	1.20
	%	0.0	0.0	0.0	0.0	100.0
Nova Scotia	$000	1,099.45	3,258.46	990.03	1,395.31	1,692.13
	%	13.0	38.6	11.7	16.5	20.1
New Brunswick	$000	413.51	843.06	1,461.15	653.51	230.51
	%	11.5	23.4	40.6	18.1	6.4
Quebec	$000	107,499.96	91,929.10	12,862.37	16,089.83	44,186.56
	%	39.4	33.7	4.7	5.9	16.2
Ontario	$000	193,517.07	95,449.65	33,239.88	45,197.01	45,673.66
	%	46.8	23.1	8.0	10.9	11.1
Manitoba	$000	1,238.22	1,745.22	734.11	958.05	829.65
	%	22.5	31.7	13.3	17.4	15.1
Saskatchewan	$000	60.56	1,073.40	841.71	39.09	108.93
	%	2.9	50.5	39.6	1.8	5.1
Alberta	$000	71,869.40	8,362.61	4,916.43	4,175.13	3,206.89
	%	77.7	9.0	5.3	4.5	3.5
British Columbia	$000	17,958.17	9,535.94	2,695.45	4,242.57	5,453.31
	%	45.0	23.9	6.8	10.6	13.7
Territories	$000	0.0	0.0	0.0	0.0	0.0
	%	0.0	0.0	0.0	0.0	0.0
Canada	$000	394,914.67	213,570.98	58,213.78	73,160.64	101,802.33
	%	46.9	25.4	6.9	8.7	12.1

Notes:

- The percentage under each R&D category gives the percentage of all money spent in that category in that province.
- Expenditures as a percentage of total means percentage of R&D expenditures in that province compared to total R&D in Canada.
- Rows and columns may not equal totals due to rounding.
- Current expenditures plus capital expenditures (equipment + depreciation) = total R&D expenditures.

Source: PMPRB