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New cancer drugs in Canada 2012 to 2021: an economic analysis of cost, benefit, availability, and public insurance coverage

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ABSTRACT

Canadian pharmaceutical policy is built on the assumption that excessive prices for patented medicines are a major cause of unsustainable growth in national health expenditures (NHEX). Federal and provincial governments have constructed a multi-layered bureaucracy to control the cost of patented medicines. The federal drug price regulator known as the Patented Medicine Prices Review Board (PMPRB), has singled-out the impact of high-cost oncology medicines as a significant challenge to sustainability. This study examined the evidence from 2012 to 2021, to determine how spending on patented oncology medicines affected the sustainability of healthcare in Canada. The cost of patented oncology drugs was compared to national health expenditure, and to the economic burden of illness associated with cancer. Government performance regarding access to innovative cancer medicines, was assessed by comparing marketing authorizations and formulary listings in publicly funded drug plans in Canada (national average of federal and provincial), the European Union (Germany), and the United States (Medicare). The evidence and analysis are presented against the backdrop of the mortality associated with cancer. Cancer ranked first for cause of death over the study but declined as a percentage of all-cause mortalities. Patented oncology drugs were only 1.3% of overall national health expenditure in 2021; and declined as a percentage of the economic burden of cancer, from 18.4% in 2012 to 15.9% in 2021. New cancer drugs defined as "high–cost" by the PMPRB accounted for only about one-tenth of one percent (0.12%) of national health expenditure. On average in Canada only 11% of new cancer drugs approved for marketing from 2016 to 2020 in at least one of three jurisdictions (EU, US, CA) were listed on a public formulary as of December 2021. The corresponding percentage for the European Union was 73% and for the United States 90%. Canada was a low priority for new cancer drug launches; approved fewer new oncology drugs; listed fewer new cancer medicines on public formularies; and Canadian oncology patients waited 1,835 days from first new drug application across the EU, US, CA to listing on a public formulary versus 788 days for Europeans, and 486 days for Americans.

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INTRODUCTION

Canadian pharmaceutical policy is built on the assumption that excessive prices for patented medicines are a major cause of unsustainable growth in national health expenditure (NHEX). Federal and provincial governments have constructed a multi-layered bureaucracy to control the cost of patented medicines. Currently several government agencies are involved in price regulation, health technology assessment, monopsony bargaining, formulary gatekeeping, and centralized procurement, plus there are proposals for a new national drug agency, a single national formulary, and national public drug insurance (pharmacare).

The federal drug price regulator known as the Patented Medicine Prices Review Board (PMPRB), has led the narrative that "excessive" prices for patented drugs threaten the financial sustainability of the healthcare system. PMPRB singled-out the impact of high-cost medicines, especially cancer drugs, stating that "The costs associated with oncology medicines present an increasingly significant challenge to the sustainability of Canadian public drug plans". (PMPRB 2021, Page 2)

This study examined the evidence over the 10-year timeframe from 2012 to 2021, to determine how spending on patented oncology medicines affected the sustainability of healthcare in Canada. National sales of patented oncology drugs (aka new, or innovative medicines) were compared to national health expenditure, and to the economic burden of illness associated with cancer. Government performance regarding access to innovative cancer medicines, was assessed by comparing marketing authorizations and formulary listings in publicly funded drug plans in Canada, the European Union, and the United States. To balance the public discussion about the cost of patented innovative cancer drugs, the EU, US and Canadian evidence regarding the health and economic benefits from pharmaceutical innovation and the impact on cancer related outcomes was discussed. To emphasize the importance of this policy issue, the evidence and analysis are presented against the backdrop of the mortality associated with cancer.

Data sources and methods are specific to each section of the analysis and are explained with the presentation of the corresponding results. **TABLE 1** shows the publicly available data used for the analysis of cancer related mortality and the relative cost of new cancer drugs.

TABLE 1. Publicly available data used for analysis.

	2012	2013	2014	2015	2016
Population of Canada	34,714,222	35,082,954	35,437,435	35,702,908	36,109,487
Gross domestic product	$1,827,203,000,000	$1,902,248,000,000	$1,994,897,000,000	$1,990,440,000,000	$2,025,535,000,000
National health expenditure	$207,998,699,791	$212,932,819,836	$219,146,914,002	$228,686,772,761	$237,986,948,717
Patented cancer drugs sales	$1,379,000,000	$1,520,000,000	$1,678,000,000	$1,898,000,000	$2,050,000,000
Economic burden of cancer	$7,500,000,000	$9,577,333,333 f	$11,654,666,667 f	$13,732,000,000 f	$15,809,333,333 f
Treatment population	578,700	589,000	607,600	600,100	464,900
Cancer mortalities	74,361	75,112	77,059	77,054	79,084
Mortalities, all causes	246,596	252,338	258,821	264,333	267,213
Active-patent cancer drugs	56	60	69	72	77
High-cost patented cancer drugs	5	8	9	11	13
Sales of high-cost cancer drugs	$13,790,000	$19,760,000	$28,526,000	$39,858,000	$49,200,000
	2017	2018	2019	2020	2021
Population of Canada	36,545,236	37,065,084	37,601,230	38,037,204	38,246,108
Gross domestic product	$2,140,643,000,000	$2,235,677,000,000	$2,311,294,000,000	$2,206,769,000,000	$2,496,175,655,725
National health expenditure	$247,954,437,208	$257,681,485,836	$269,441,438,741	$305,085,706,791	$328,413,450,813
Patented cancer drugs sales	$2,324,000,000	$2,939,000,000	$3,584,000,000	$3,947,000,000	$4,172,000,000
Economic burden of cancer	$17,886,666,667 f	$19,964,000,000 f	$22,041,333,333 f	$24,118,666,667 f	$26,196,000,000
Treatment population	468,600	512,500	567,100	562,800	561,600
Cancer mortalities	80,023	79,726	80,361	80,973	81,590 f
Mortalities, all causes	278,298	285,675	285,270	291,054 *	289,511 *
Active-patent cancer drugs	80	91	94	105	113
High-cost patented cancer drugs	15	21	23	26	33
Sales of high-cost cancer drugs	$74,368,000	$141,072,000	$247,296,000	$335,495,000	$404,684,000

"f" forecasted; * Excluding COVID-19 deaths

ANALYSIS

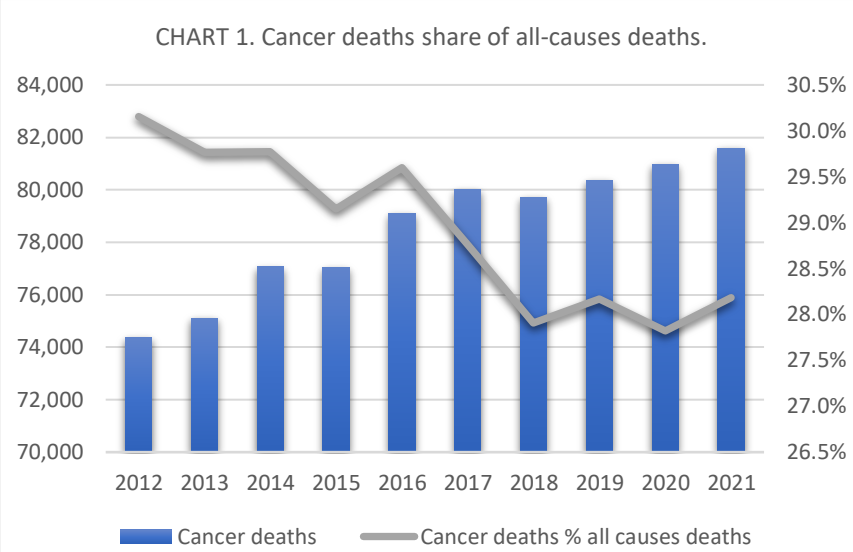
Cancer Mortality

Cancer is the leading cause of death in Canada (Statistics Canada 2023b, 2023c). **TABLE 2** shows the rank of the top ten leading causes of death in Canada from 2012 to 2020. 2020 was the most recent data available. The analysis of ranks excluded 16,151 deaths from COVID-19 coronavirus in 2020 which would have ranked third highest.

TABLE 2. Rank of leading causes of death.

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Malignant neoplasms (cancer)	1	1	1	1	1	1	1	1	1
Diseases of heart	2	2	2	2	2	2	2	2	2
Cerebrovascular diseases	3	3	3	3	3	4	4	4	4
Accidents (unintentional injuries)	4	5	5	5	4	3	3	3	3
Chronic lower respiratory diseases	5	4	4	4	5	5	5	5	5
Diabetes mellitus	6	6	6	7	6	7	7	6	6
Alzheimer's disease	7	8	8	8	7	8	8	8	8
Influenza and pneumonia	8	7	7	6	8	6	6	7	7
Intentional self-harm (suicide)	9	9	9	9	9	9	9	9	11
Nephritis, nephrotic syndrome, nephrosis	10	10	11	11	11	11	10	10	10
Chronic liver disease and cirrhosis	11	11	10	10	10	10	11	11	9

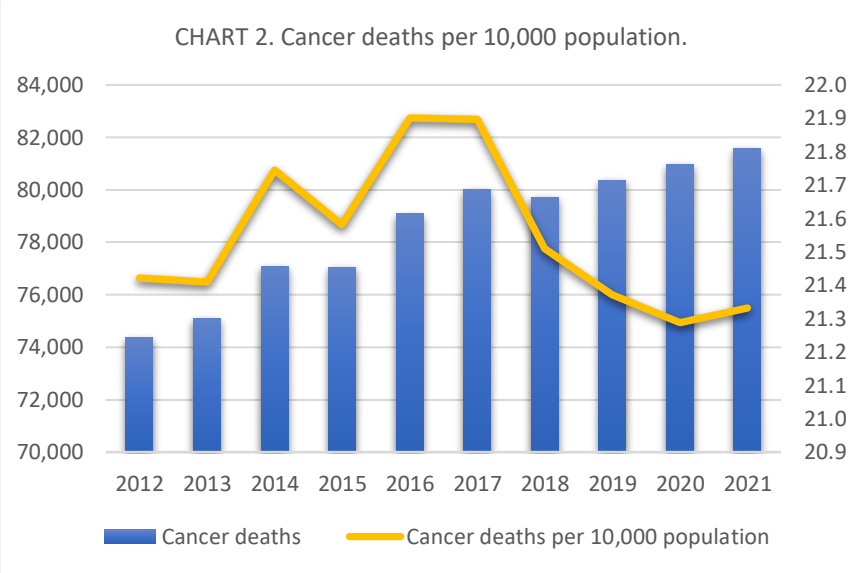
CHART 1 shows the number of mortalities caused by cancer (data are plotted as bars on the primary vertical axis) and as a percentage share of the number of mortalities attributable to all causes (data are plotted as a line on the secondary vertical axis) from 2012 to 2021. (Statistics Canada 2023b, 2023c)



2021 cancer mortality data was not available and was forecast based on the average annual growth observed for the preceding year. The all-causes mortalities data were available for all 10 years. The analysis excluded 16,151 deaths from COVID-19 in 2020 and 21,681 in 2021.

There were 74,361 deaths due to cancer in Canada in 2012 rising to an estimated 81,590 in 2021. Over the entire ten-year timeframe, there were 785,343 cancer mortalities. In 2012 cancer accounted for 30.2% of all-cause mortalities (246,596). By 2021 the cancer percentage of all deaths (289,511) declined to 28.2%. The low point was 27.8% in 2020. Over the ten-year period from 2012 to 2021 the share of total mortalities (2,719,109) attributable to cancer was 28.9%.

CHART 2 shows the number of mortalities caused by cancer (plotted as bars on the primary vertical axis) and as a ratio per 10,000 population (plotted as a line on the secondary vertical axis) from 2012 to 2021. Accounting for changes in population over time, cancer deaths per 10,000 population remained stable from 21.4:10,000 in 2012 to 21.3:10,000 in 2021, averaging 21.5:10,000 over the 10-year period. Mortalities from cancer per population were trending downward from 21.9: 10,000 in 2016 to 21.3: 10,000 in 2020 and 2021.



Overall, both metrics indicate cancer remains the most significant cause of death in Canada even though the number of cancer deaths has fallen relative to mortalities from all causes and relative to the general population over the years 2012 to 2021.

Cost of Patented Oncology Drugs

National Health Expenditure

To put the cost of cancer drugs in an economic context, national sales of patented oncology drugs (PMEX-C) was compared to total national health expenditure (NHEX) and to the economic burden of illness associated with cancer (EBI-C) in Canada.

The analysis used annualized data covering 10 years from 2012 to 2021 obtained from the annual reports of the Patented Medicine Prices Review Board (PMPRB). The data identified all sales of patented medicines across all therapeutic classes, and separately for all sales of patented oncology drugs. Sales data were defined as national sales of all patented medicines, non-veterinary use, hospital and retail pharmacy sales, cost measured at manufacturer list prices excluding confidential rebates, and excluding ancillary and downstream supply chain costs.

The sales data were published by annual treatment cost threshold permitting an identification of sales of high-cost patented oncology drugs by using the percentage of total sales of patented oncology drugs attributable to each annual cost threshold. (PMPRB 2022)

In addition, PMPRB publishes annual data for the number of patented oncology drugs as a total and by annual treatment cost threshold, as well as the number of oncology patients. (PMPRB 2022)

Data for national health expenditure, gross domestic product (GDP), and national population (POP) were obtained from the Canadian Institute for Health Information (CIHI) covering 2012 to 2021. The Statistics Canada Consumer Price Index (CPI) (Statistics Canada 2023a) was used (where noted) to adjust for inflation over the study timeframe.

CHART 3. Expenditure on patented oncology drugs versus all other national health expenditure 2021, stated in millions of current dollars and as a percentage of the total.

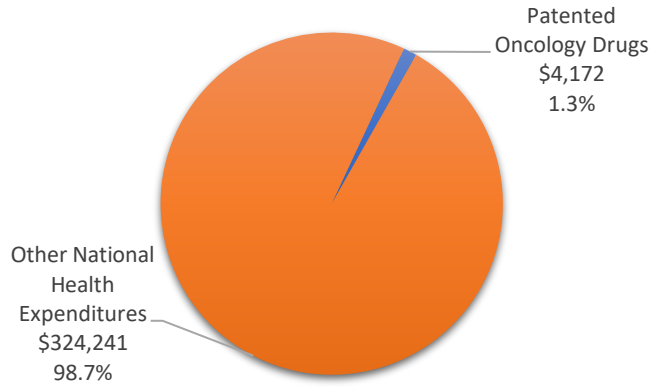
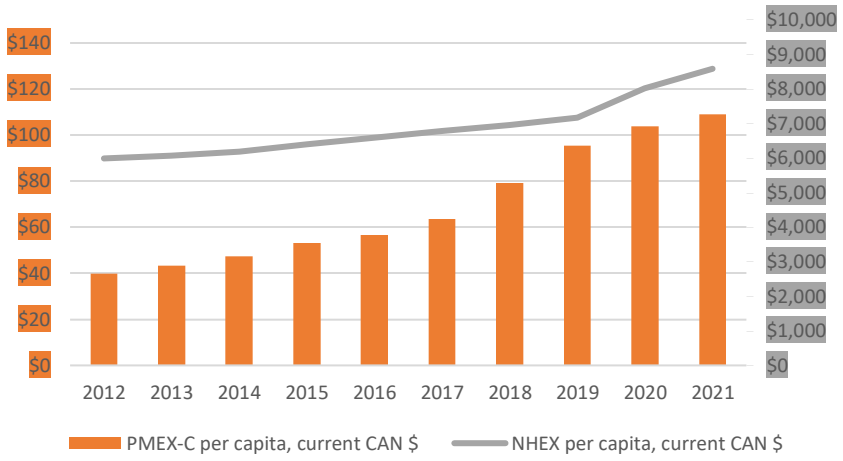


CHART 4. Expenditure per capita, patented oncology drugs versus national health expenditure.



The results of the analysis showed that expenditure on patented oncology drugs was a very small fraction of total national health expenditures **[CHART 3]**. In 2021 overall national expenditure on health was $328.4 billion (CIHI 2022). PMPRB data indicate that total national expenditure on patented oncology drugs was $4.2 billion, accounting for only 1.3% of overall national health expenditure in 2021. The rest of national health expenditure amounted to $324.2 billion and accounted for 98.7% of the total.

Expenditure on patented oncology medicines has been a small fraction of overall national health expenditure over the entire 10-year study period. **CHART 4** shows cost per capita for overall national health expenditure (data are plotted as a line on the secondary vertical axis) and for expenditures on patented oncology drugs (data are plotted as bars on the primary vertical axis) for each year from 2012 through 2021.

On a per capita basis, expenditure on patented oncology drugs increased 174% from $40 in 2012 to $109 in 2021. Over the same time frame national health expenditure per capita increased 43% from $5,992 in 2012 to $8,587 in 2021. Patented oncology drugs accounted for 0.7% national health expenditure per capita in 2012 and 1.3% of national health expenditure per capita in 2021.

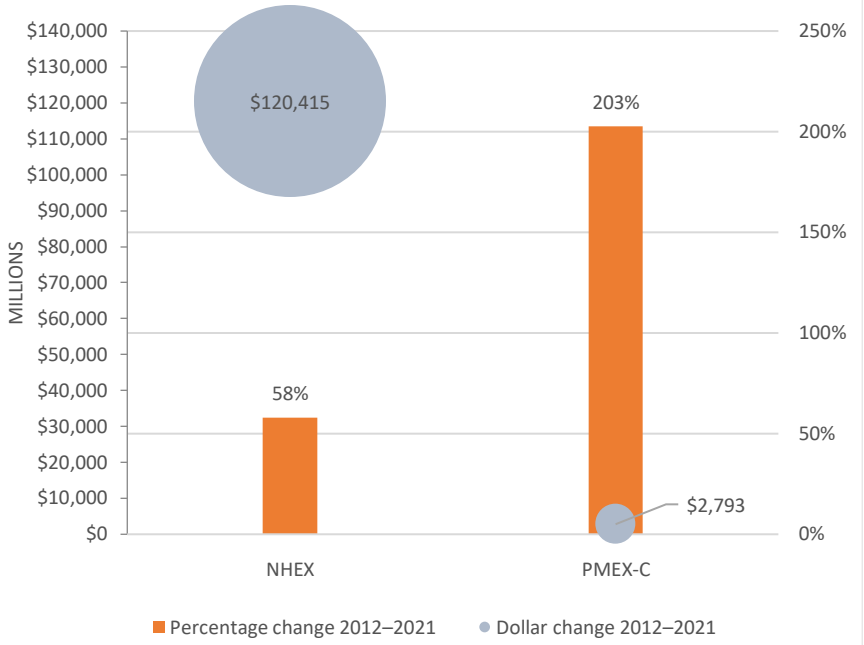
It is important not to exaggerate the significance of the relative growth rates of expenditure on patented oncology drugs versus national health expenditure. The sustainability of health spending is not affected by the percentage growth of its sub-components *per*

se, but by the absolute increase in dollars spent. Patented oncology drug expenditures start from a much lower base therefore even small absolute increases can produce large magnitude percentage changes.

This concept is illustrated in **CHART 5**. Overall national health expenditure was $208 billion in 2012 rising to $328.4 billion in 2021 for a 10-year increase of 58%. This compares to total national expenditure on patented oncology drugs of $1.4 billion in 2012 and $4.2 billion in 2021 for a 10-year increase of 203%. Yet the absolute increase in spending on patented oncology drugs was only $2.8 billion from 2012 to 2021, and over the same timeframe the absolute increase in national health expenditure was $120.4 billion.

The growth in actual dollars spent on patented oncology drugs was only 2.3% of the growth in actual dollars spent in total for all healthcare from 2012 to 2021. Inversely, the absolute growth in actual dollars for national health expenditure was more than 43 times larger than the absolute growth in spending on patented oncology drugs over this ten-year period.

CHART 5. Percentage change and dollar change in national health expenditure (NHEX) and patented medicines expenditure for oncology drugs (PMEX-C) 2012 to 2021.



Economic Burden of Cancer

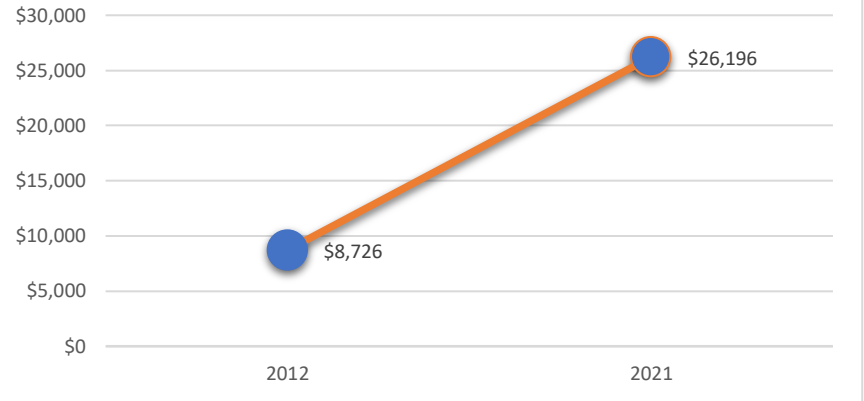
The economic burden of illness associated with cancer is significant. Researchers estimated that the societal cost of cancer in Canada rose from $2.9 billion in 2005 to $7.5 billion in 2012 (Brenner et al 2020; Canadian Cancer Statistics Advisory Committee 2021).

Other research estimated the total cost of cancer in Canada from a society perspective to be almost $26.2 billion in 2021 (Garaszczuk et al 2022). Direct health system costs totaled $18.4 billion (70%) and direct patient out of pocket costs totaled $3.1 billion (12%), while time costs and other indirect costs comprised the balance of the estimate.

There were no published estimates of the economic burden of cancer for the interim years between 2012 in 2021. To compare the change in expenditure on patented oncology drugs versus the economic burden of cancer during the interim years, a linear projection was calculated from available data for 2012 and 2021 based on proportionally equal incremental changes between years. The resulting set of numbers could be plotted as a straight trend line between the known values at the beginning and end of the period.

The two published estimates of the economic burden of illness associated with cancer are plotted in **CHART 6**. The 2012 estimate of $7.5 billion was inflated to constant 2021-dollar values ($8.7 billion) for comparability. The 2021 estimate ($26.2 billion) of the economic burden of cancer exceeds the 2012 estimate ($8.7 billion current 2021 $) by 200% ($17.5 billion).

CHART 6. Economic burden of cancer in Canada 2012 versus 2021, stated in millions constant 2021 Canadian dollars.



Cost growth is explained by potential differences in methodology, data comparability, and changes in factors affecting the calculation of the economic burden like population, income, healthcare cost, utilization, and the value assigned to metrics used in the calculation like the value of a statistical life-year, disability adjusted life years, etc.

According to data published in the annual reports of the PMPRB (PMPRB 2022) **[CHART 7]**, the population of oncology patients in Canada has declined slightly over the 10 years from 2012 (578,700 patients) to 2021 (561,600 patients).

Over the same period, expenditure on patented oncology drugs increased 312% (31.2% per year on average) from $2,383 per patient in 2012 to $7,429 per patient in 2021.

The economic burden of cancer is also plotted on the chart showing an estimated cost of $7.5 billion in 2012 (unadjusted for inflation) and $26.2 billion in 2021 for an increase of $18.7 billion (250%) over this period.

Again, as mentioned previously, growth rates of expenditure on patented oncology drugs start from a much lower base therefore even small absolute increases can produce large magnitude percentage changes; while overall cost, in this case the economic burden of cancer, is not disproportionately affected.

The concept is illustrated in **CHART 8**, which compares the percentage share of the economic burden of cancer attributable to direct spending on patented oncology drugs from 2012 versus 2021. As previously noted, national spending on patented oncology drugs (PMEX-C) was $1.4 billion in 2012 and $4.2 billion in 2021, while the national economic burden of cancer (EBI-C) was estimated to be $7.5 billion in 2012 and $26.2 billion in 2021.

Based on the available data, expenditure on patented oncology drugs grew by 203%, but still declined as a percentage of the economic burden of cancer, from 18.4% in 2012 to 15.9% in 2021 (the remaining share attributable to other factors in the EBI – $6.1 billion in 2012; $22.0 billion in 2021 – were calculated by subtracting PMEX-C from the total EBI-C).

An alternative presentation of the data is shown in **CHART 9,** which illustrates the proportional difference between national health expenditures ($328.4 billion), the economic burden of illness associated with cancer ($26.2 billion), expenditures on patented oncology drugs ($4.2 billion), and finally expenditures on high cost patented oncology drugs (HCPMEX-C) ($404.7 million), the latter being about one-tenth of one percent (0.12%) of national health expenditure in 2021.

CHART 7. Number of cancer patients, expenditure on patented oncology medicines per patient, economic burden per patient, current CAD.

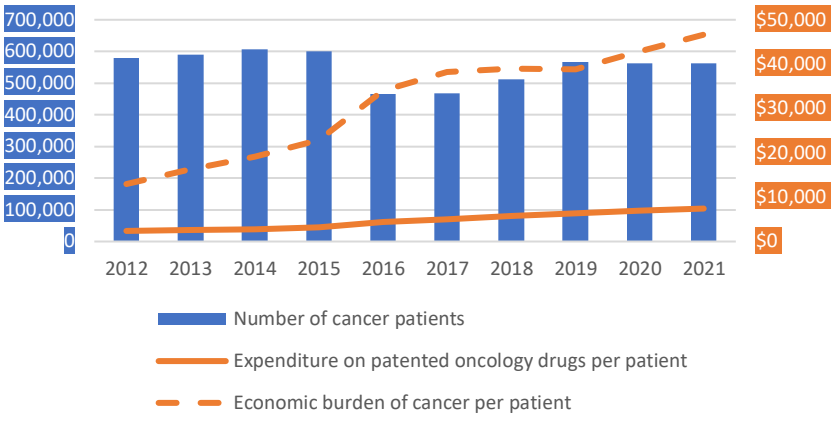


CHART 8. Patented oncology drugs direct share of the economic burden of cancer, millions current Canadian dollars.

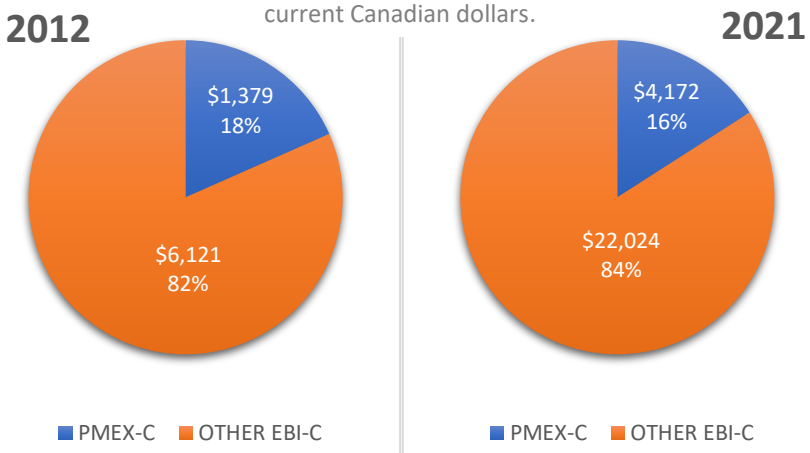
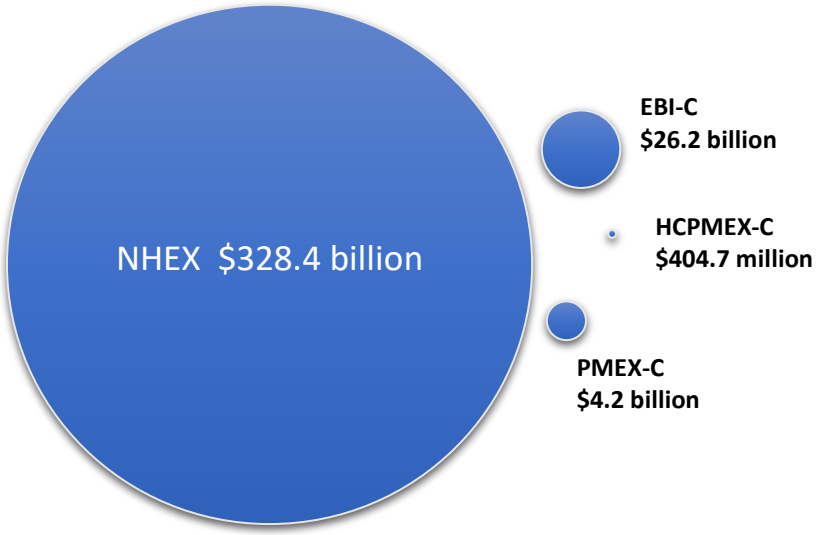


CHART 9. Sales **high-cost** and total new cancer drugs, national health expenditures, economic burden of cancer, 2021.



Availability and Insurance Coverage Rates, and Waits for New Cancer Drugs

Method

Using data stored in the Canadian Health Policy Institute's Canadian Access to Innovative Medicines Database (CA2IMDB), the availability and insurance coverage for new cancer drugs in Canada, the European Union, and the United States were examined by RATE (number, percentage of total) and by WAIT (days).[1]

The RATE metric for availability of new patented oncology drugs was defined by the count of marketing authorizations (MA) using the group of new active substances (NAS) approved by Health Canada during the years 2016 to 2020 as a benchmark. Some of the new drugs approved by Health Canada during the study period, were approved by the FDA or the EMA in earlier years. Products approved by the FDA, or the EMA were deemed to be accrued to the period under analysis according to three criteria:

- NAS approved by the EMA and/or the FDA from 2016-2020 that were exact matches of NAS approved by Health Canada from 2016-2020.
- NAS approved by the EMA and/or the FDA before 2016 that were exact matches of NAS approved by Health Canada from 2016-2020 (i.e., accrued marketing authorizations).
- NAS approved by the EMA and/or the FDA from 2016-2020 that were different from the drugs approved by Health Canada from 2016-2020.

Having met the criteria meant the product was available, presuming that each jurisdiction could have opted to implement the marketing authorizations of the other jurisdictions through regulatory harmonization (See POLICY DISCUSSION).

The RATE metric for insurance coverage was the count of the cancer drugs with a recorded formulary listing date in the database, and stated as a percentage of total new cancer drugs approved by at least one of the EU, US, or CA.

WAIT metrics were defined by three consecutive segments of time, which combined represent the sum total delay to accessing new cancer drugs in publicly funded drug insurance programs, specified as:

- Launch delay: the number of days lapsed between the date that the first new drug application (NDA) was submitted in at least one of the three jurisdictions, and the domestic submission date of an NDA.
- Regulatory process delay: the number of days lapsed between the domestic submission date of an NDA, and the domestic MA date.
- Insurance coverage delay: the number of days lapsed between the domestic MA date, and the domestic date that the medicine was listed on an insurance formulary (FL) in the jurisdiction.

Data

Product-level data for new drug applications (NDA), and marketing authorizations (MA) of new oncology drugs were obtained from Health Canada for five years from 2016 to 2020. Comparable European and US data was published by the European Medicines Agency (EMA) and the Food and Drug Administration (FDA) and available online.

Product-level data for Canadian public drug formulary listings of new oncology drugs were obtained from IQVIA®, and federal, and provincial drug formularies and cancer care agencies. Product-level data for the insurance coverage experience of new drugs in the EU and the US were not available. An approximation was substituted based on the structure of pricing and reimbursement in publicly funded drug plans in the European Union and Medicare Part D in the United States.

In Europe, marketing authorization is centralized, but prescription drug insurance is the responsibility of the national entities of the EU. It was beyond the scope of the study to collect data from each of the national jurisdictions, so Germany was used as a proxy. Germany is not generally representative of the European situation but is presented here as a prominent market and model example. In Germany, publicly funded drug benefits are provided through the statutory health insurance funds, and beneficiaries are exposed to deductibles and copayments. Due to the structure of public drug reimbursement in Germany (explained later in this paper, see "Expedited formulary listing"), new medicines are added to public formularies immediately following EMA marketing authorization. (OECD 2018)

1 Canadian federal and provincial formulary data were aggregated at the national level by jurisdictional population weighted average. The analysis does not account for the conditional status of the formulary listing (i.e. full benefit versus special authorization/ limited use/ exceptional access).

TABLE 3. Cancer drugs with marketing authorizations approved or accruing in at least one of the EU, US, CA 2016-2020.

AKYNZEO	BRAFTOVI	DEFITELIO	IBRANCE	LONSURF	NUBEQA	RETEVMO	TECENTRIQ	XOSPATA
ALECENSA	BRUKINSA	DEMYLOCAN	IDHIFA	LORBRENA	ODOMZO	ROZLYTREK	TIBSOVO	YESCARTA
ALIQOPA	CABLIVI	ELZONRIS	IMFINZI	LUMOXITI	PADCEV	RUBRACA	TUKYSA	ZEJULA
ALUNBRIG	CABOMETYX	EMPLICITI	INQOVI	LUTATHERA	PIQRAY	RYDAPT	TURALIO	
AYVAKIT	CALQUENCE	ENHERTU	INREBIC	LYNPARZA	POLIVY	SARCLISA	ULTOMIRIS	
BALVERSA	COTELLIC	ERLEADA	KISPLYX	MEKTOVI	PORTRAZZA	TABRECTA	UNITUXIN	
BAVENCIO	DACOGEN	FOLOTYN	KISQALI	MONJUVI	POTELIGEO	TAGRISSO	VENCLEXTA	
BESPONSA	DANYELZA	FOTIVDA	KYMRIAH	MYLOTARG	QARZIBA	TALZENNA	VERZENIO	
BESREMI	DARZALEX	GAMIFANT	KYPROLIS	NERLYNX	QINLOCK	TAVALISSE	VITRAKVI	
BLENREP	DAURISMO	GAVRETO	LIBTAYO	NINLARO	REBLOZYL	TECARTUS	VIZIMPRO	

In the United States publicly subsidized drug benefits are provided through Medicare Part D, which is financed from general revenues (73%), beneficiary premiums (15%), and state contributions (11%). Medicare Part D drug plan sponsors must review new drugs and decide on coverage within 180 days of FDA approval. Formularies must include at least two chemically distinct drugs for each therapeutic class, and any additional drugs presenting therapeutic advantages. Part D plan sponsors typically list all NAS drugs on formulary and adjust the level of insurance coverage by tiered premiums, deductibles, and copayments. (U.S. Centers for Medicare & Medicaid Services 2022)

Based on the characteristics of the German and US public drug insurance systems, the analysis of insurance coverage assumed that German public drug plans cover all NAS approved by the EMA within 90 days, and that US Medicare Part D drug plans covered all NAS approved by the FDA within six months.

Results

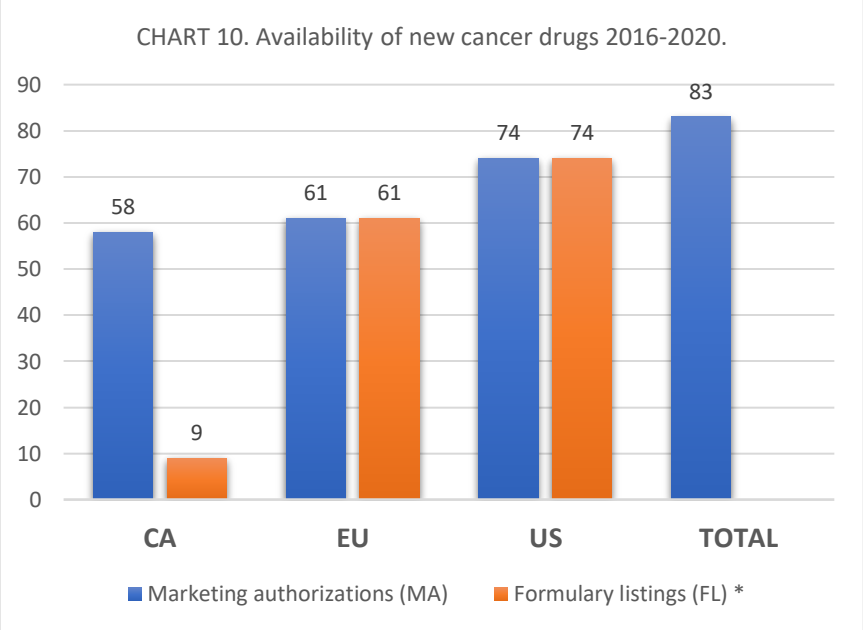
CHART 10 summarizes the results for the availability and insurance coverage of new cancer drugs on two metrics: (1) the number of domestic marketing authorizations among the group of new cancer drugs that were approved by at least one of the EMA, FDA, or HC during 2016 to 2020; and (2) the number of these drugs listed on public formularies as of December 2021.[2]

The analysis identified [**TABLE 3]** 83 patented cancer drugs that matched the criteria for inclusion in the analysis because they were approved by Health Canada from 2016-2020 and/or approved by the EMA or FDA during 2016-2020 or were accrued marketing authorizations of the drugs approved by Health Canada from 2016-2020.

Of these new cancer drug approvals 58 received marketing authorization in Canada during the five years from 2016 to 2020. The rate of availability for new patented cancer drugs was 70% over the five-year study period.

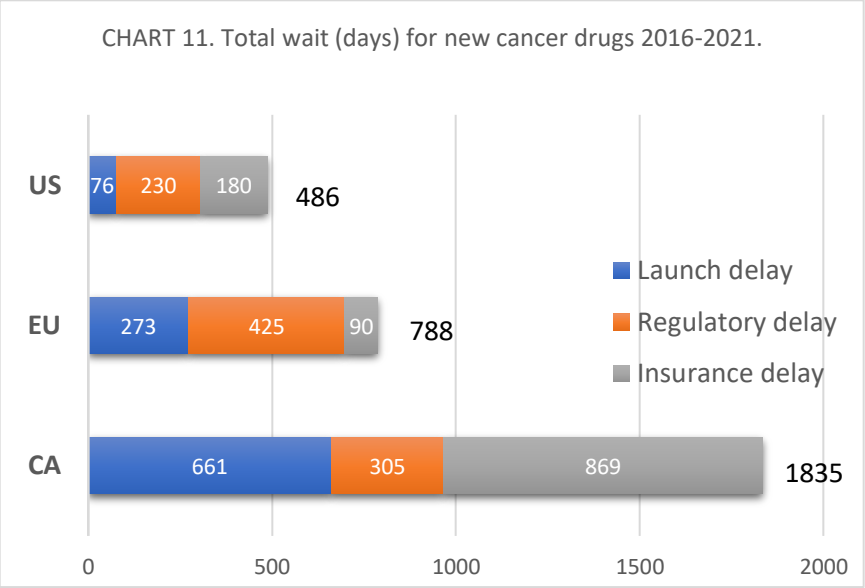
The rate of insurance coverage was much lower. On average only 9 of the 83 new cancer drugs were listed on a public formulary as of December 2021, for a 11% insurance coverage rate.

By comparison, the rate of availability for new cancer drugs in the United States was 74 of the 83 available drugs or 90%, and the insurance coverage rate for these new drugs was the same percentage. While the rate of availability for new cancer drugs in the European Union was 61 of the 83 available drugs or 73%, with an insurance coverage rate at the same percentage.



2 * Canadian federal and provincial formulary data is an average.

The analysis also used three time-based metrics to estimate the launch delay, regulatory delay and the insurance coverage delay affecting patient access to newly developed oncology drugs. **CHART 11** summarizes the wait times observed for the three segments. The total number of days spent across the three segments is shown at the outside end of each bar in the chart. The launch delay segment is an average weighted by the number of drugs for which the jurisdiction was first to receive an NDA. Of the 83 drugs the US was first to get an NDA for 64, the EU for 18, and CA for 1.



The data indicate that Canadian patients waited 661 days due to delayed launches of new cancer drugs; plus 305 days due to the regulatory delay associated with marketing authorization, and 869 additional days due to delays associated with Insurance coverage under public drug plans, for a total wait of 1,835 days (five years) to access the few oncology drugs that are made available in publicly funded drug plans. Corresponding numbers for the United States were: launch delay 76 days; regulatory delay 230 days; and Insurance coverage delay 180 days; for a total delay of 486 days. For the European Union numbers were: 273 days, 425 days, and 90 days respectively, for a total of 788 days.

The results of analysis suggest that from 2016 to 2021: (1) the Canadian market was a low priority for new cancer drug launches; (2) Canada approved fewer new oncology drugs for use by patients; (3) coverage of new cancer medicines in Canadian publicly funded prescription drug insurance plans was well below that of public drug plans in Europe and the United States; and (4) Canadian oncology patients waited more than twice as long as Europeans, and 2.5 times longer than US patients to get access to new cancer drugs in a publicly funded drug plan.

POLICY DISCUSSION

Cost Versus Benefit

National expenditure on patented oncology drugs was too small in absolute dollar terms to have disproportionately affected the deteriorating sustainability of healthcare financing in Canada over the 10 years spanning 2012-2021. The most likely effect that new oncology drugs had over the study period was to avoid economic costs that would otherwise have occurred in the absence of pharmaceutical innovation and the utilization of new drug therapies. Empirical econometric analyses have repeatedly confirmed a statistically significant correlation between use of innovative pharmaceuticals and improvements in population health outcomes including indicators like reduced mortality, longer life expectancy, longer survival, fewer potential life-years lost, etc. Pharmaceutical innovation has also been found to be linked to lower potential healthcare costs and lower societal economic costs. (CHPI 2019)

The world's leading expert in this field is Frank R Lichtenberg, professor of economics at Columbia University. Lichtenberg has published numerous cancer-related econometric studies on the impact of pharmaceutical innovation on patient-level and population-level health outcomes, healthcare costs, and associated societal-level economic costs. In a recent US study, Lichtenberg (2020) estimated that cancer drugs approved during 2000-2014 saved 719,133 life-years in 2014, while the cost per life-year gained for those drugs was only $7,853 (USD 2014). The most recent estimate published by US Department of Health and Human Services for the value of a statistical life-year in the United States in 2021 ranged from $270,000 to $890,000 USD (US HHH 2021).

In an earlier study, Lichtenberg (2014) observed a 13.8% decline of the age-adjusted cancer mortality rate in the United States during 2000–2009, he estimated that drug innovation and imaging innovation reduced the cancer mortality rate by 8.0% and 4.0%, respectively, while decline in incidence reduced the cancer mortality rate by 1.2%. In another US study, Lichtenberg (2008) estimated that chemotherapy innovation accounted for 74% of the increase in the 1-year observed survival rate for cancer during the period 1992-2001.

Research on the impact of pharmaceutical innovation on Canadian populations include a study by Lichtenberg (2019) that assessed the impact of pharmaceutical innovation on the burden of disease in Canada, finding that new drug launches during 1986-2001 reduced the age-standardized years of life lost (YLL) rate in 2016 by 28%; reduced the number of disability adjusted life years (DALYs)

lost in 2016 by 2.31 million; and that if no drugs had been launched during 1986-2001, average length of 2016 hospital stays would have been about 16% higher.

Lichtenberg (2015) also analyzed the effect that pharmaceutical innovation had on premature cancer mortality in Canada during the period 2000-2011 and found that pharmaceutical innovation during the period 1985-1996 reduced the number of years of potential life lost to cancer in 2011 by 105,366. The cost per life-year gained from previous pharmaceutical innovation was estimated to have been only $3,189 in 2021 dollars (converted from $2,730 US dollars using the 2011 annual average CA:US dollar noon exchange rate published by the Bank of Canada: 0.98906920 and inflated to 2021-dollar values using Statistics Canada Consumer Price Index), which is far less than the estimated $143,000 to $305,000 CAD 2007 (or $182,000 to $387,000 CAD 2021) value of a statistical life-year published by the Government of Canada (2007).

Given the evidence of the impact from previous pharmaceutical innovation on improving population health outcomes in general, and for cancer patients in particular, and the link between pharmaceutical innovation and lower potential healthcare and societal economic costs, facilitating the development and utilization of new oncology drugs should be a high public priority. Policymakers concerned about the sustainability of healthcare financing in Canada should not ignore the prices of new patented oncology drugs, but they should be wary of imposing disproportionate cost containment measures that could discourage development and utilization of cost-efficient technologies.

Eliminate Price Regulations

Price regulation affects the availability of innovative cancer therapies by delaying new drug launches (Labrie 2020; Rawson 2023). The federal government should end its price control regime and decommission the PMPRB because the Board's function is redundant. Several other agencies are involved in regulating the efficacy and price of new drugs. Health Canada authorizes marketing of new drugs on the basis of safety and efficacy. Once approved, new cancer drugs are subject to health technology assessment (HTA) by the Canadian Agency for Drugs and Technology in Health (CADTH) and its pan-Canadian Oncology Drug Review Expert Review Committee (pERC), which makes reimbursement recommendations for oncology drugs to the participating federal, provincial, and territorial publicly funded drug programs. Quebec utilizes its own HTA agency known as the Institut national d'excellence en santé et en services sociaux (INESSS). Manufacturers of new drugs then enter price negotiation with the pan-Canadian Pharmaceutical Alliance (PCPA), which acts as a monopsony on behalf of every federal and provincial public drug plan.

Regulatory Harmonization

The availability and wait for new cancer drugs could be improved through regulatory harmonization under which, Health Canada would automatically and immediately recognize new drug approvals occurring first in either the EMA or the FDA. Health Canada could implement this policy unilaterally without requiring mutual recognition. Scientific standards for new drug applications are the same for Health Canada, the EMA and the FDA. The duplicate process is an unnecessary redundancy and avoidable delay.

Expedited Formulary Listing

Public drug insurance programs should not make formulary listings dependent on the prices of innovative oncology drugs. New medicines that show any sign of therapeutic benefit should be listed on drug formularies immediately after receiving marketing authorization.

Germany provides a real-world model for expediting insurance coverage for new medicines that could be useful to inform discussion of this issue in Canada. The German system for pharmaceutical pricing and reimbursement in its public drug plans is based on structured negotiation instead of regulation and is designed to allow immediate interim insurance coverage following marketing authorization, with permanent insurance coverage pending the outcome of negotiations. Under the German Medicines Market Reorganization Act (AMNOG) 2011, pharmaceutical manufacturers launching a new drug on the market, are free to set the price for a maximum of twelve months. Manufacturers must submit clinical evidence to the Federal Joint Committee (G-BA) that proves the additional benefit of the drug. If there is additional therapeutic benefit, the manufacturer negotiates the price at which the drug will be reimbursed by the statutory health insurance funds. Price negotiations must reach agreement within six months. If no agreement can be reached, an arbitration board decides on the reimbursed price using European reference prices. There is an appeal process. Drugs lacking evidence of additional therapeutic benefit are reimbursed in the reference group price system. (OECD 2018)

While reducing the Insurance coverage delay to accessing new cancer drugs, the German approach has the added advantage of diversifying the treatment options available to a heterogeneous patient population. Product diversity should be an important consideration for policymakers because people respond differently to therapies.

Eliminating formulary restrictions also increases inter-product price competition between therapeutic alternatives, even among patent protected drugs. Roediger et al (2019) observed that concerns regarding the high price of innovative medicines rarely account

for the evolution of prices over the lifetime of the medicine and the impact of competitive forces. The researchers examined seven European countries from 2011—2017 and found that in-class competition was associated with lower prices, reduced market share, and shortened economic product life, the latter being reduced to only a fraction of the patented period. Lichtenberg and Philipson (2002) estimated that between-patent competition, most of which occurs while a drug is under patent, costs the innovator at least as much as generic competition, which cannot occur until a drug is off patent.

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