

# Economic value of the utility-expansion for new cancer drugs approved in Canada from 2004 to 2014.

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## SUMMARY

### Introduction

In the Canadian health technology assessment (HTA) process, drugs are evaluated for clinical and cost-effectiveness following Health Canada marketing approval. Usually, each drug indication is evaluated by HTA bodies individually in line with the specific indication granted by Health Canada. However, when a cancer drug is reviewed for its initial indication, HTA evaluators are not fully able to assess the future additional benefits that accrue from successive approved indications. Subsequently, at the payer level, the discussion and review is focused more around price rather than value. Many cancer drugs are approved for multiple indications over the course of their product life-cycle. The next generation of cancer therapies, especially immuno-oncology treatments, are being studied for multiple indications. The expanded utility provided by cancer drugs is not fully captured in the HTA process.

### Objective

Empirically demonstrate the utility-expansion that occurs over the product life-cycle of health technology by use of a case study focused on new cancer drugs in Canada, and discuss how the HTA process can be enhanced to consider the value of the utility-expansion.

### Data

Clinical trial data of the drugs examined in the analysis derive from each drug's product monographs, Health Canada, the Canadian Cancer Society, Statistics Canada and the U.S. Food and Drug Administration (FDA).

### Results

The study identified 11 cancer drugs approved in Canada during 2004-2014 which were subsequently approved for 22 additional cancer indications. The potential annual economic value from the utility-expansion provided by these cancer drugs is an estimated \$1.9 billion to \$8.4 billion in 2015.

### Conclusions

Utility-expansion is evidenced in a number cancer drugs that are approved in Canada for multiple cancer indications. HTA evaluations of new cancer drugs that can respond to the utility-expansion occurring over the product life-cycle would lead to reimbursement recommendations that are more optimal in maximizing health and economic returns from the adoption of the new health technologies.

# Introduction

Before new drug products can be sold in Canada they must be certified as safe and effective by Health Canada. Health Canada's drug marketing approvals are issued for specific health conditions or "indications" only. Each drug product may only be marketed for the particular use approved by Health Canada. If it is later discovered that the drug is effective to treat additional health conditions, then separate marketing approvals must be obtained from Health Canada for each subsequent indication.

Following Health Canada's initial marketing approval for a new drug product, health technology assessments (HTA) are conducted by the Common Drug Review (CDR) for non-cancer drugs and the pan-Canadian Oncology Drug Review (pCODR) for cancer drugs. Quebec has its own HTA process through the Institut national d'excellence en santé et en services sociaux (INESSS). The recommendations are then utilized by public drug insurance plans to guide eligibility and conditions for reimbursement of new drug products.

Current HTA methods focus on the value demonstrated for the specific indication for which the new drug receives Health Canada approval. HTA evaluations of drugs are typically first undertaken when a drug is launched for its first Health Canada-approved indication. This means that a drug may undergo several HTA evaluations as Health Canada approves additional indications for the drug.

Numerous cancer drugs are subsequently approved by Health Canada for other cancer treatments after their initial approved cancer indication. The expansion of uses (or the utility) for a cancer drug occurs when the drug can:

- Treat a different cancer type;
- Treat at a different disease stage (e.g. locally advanced, metastatic);
- Be used in a different treatment line or treatment regimen; or
- Be extended to a broader patient population.

HTA evaluations of drugs focus on assessing the cost-effectiveness of a drug within the context of a specific indication. The process does not capture the value a drug might provide over the product life-cycle across its potential uses.<sup>1</sup>

New cancer therapies, especially immunotherapy drugs, undergo clinical trials for use in many types of cancer.<sup>2</sup> The R&D process for cancer drugs is long with evidences and outcomes that are difficult for the HTA process to fully capture at a single point in time, such as when a cancer drug is reviewed for its first indication.

If HTA evaluations of new cancer drugs were designed to respond to the potential utility-expansion that can occur over the product's life-cycle, then reimbursement recommendations could be made more optimal in terms of maximizing health and economic returns from the adoption of new technology.

<sup>1</sup> The first mention of the concept that we are aware of is Rejon-Parilla *et al* (2014). The expanding value footprint of oncology treatments. Office of Health Economics, UK and University of Washington School of Pharmacy. May 2014. Consulting report commissioned by Eli Lilly and Company, Global Public Policy.

<sup>2</sup> American Cancer Society. *What's new in cancer immunotherapy research?*. Accessed online: <http://www.cancer.org/treatment/treatmentsandsideeffects/treatmenttypes/immunotherapy/immunotherapy-whats-new-immuno-res>

## Objective

The first objective of the study is to empirically demonstrate the economic value of the utility-expansion that occurred for the group of cancer drugs approved by Health Canada during 2004 to 2014. The analysis is not an inquiry or a comparison of the effectiveness of cancer drugs.

The second objective is to discuss how current HTA methods can be enhanced to accommodate the utility-expansion of health technology over a product life-cycle.

The study is not a critique of government policies, HTA agencies or processes, or specific HTA decisions. It is a general demonstration and discussion of the HTA process in the context of utility-expansion. It acknowledges the legitimate challenges faced by HTA agencies and payers. This study attempts to contribute evidence and insights that could potentially lead to helpful solutions for decision-makers.

The study is intended to raise awareness of the need for a more holistic and wider appreciation of the value provided by new cancer and immuno-oncology therapies in HTA evaluations. Currently value is given a narrow HTA definition and then at the payer level, the discussion and review focuses more around price rather than value. Many innovative drugs will receive approvals for subsequent indications over time. The authors are sensitive to the fact that HTA agencies and payers are understandably worried about subsequent indication expansion and how to manage this.

## Data

The analysis focuses on all of the cancer drugs approved for sale (received NOC) in Canada during 2004 to 2014 and which Health Canada subsequently approved for additional cancer indication(s) up to the end of 2014.

Cancer drugs that received approval for subsequent new drug submissions (SNDs) for reasons such as change in packaging, manufacturing process, labelling, etc. are not included in the analysis. Drug approval data were obtained from Health Canada's Notice of Compliance Database.<sup>3</sup>

Clinical trial data documented in drug product monographs provided survival data (primary and secondary endpoints) used to estimate incremental survival benefit of the drugs. Health Canada and the U.S. Food and Drug Administration (FDA) rely on clinical trial data from product monographs in their approval process. The analysis also draws on clinical information publically available from Health Canada and the FDA.

Data on the number of new patients by cancer type were from the Canadian Cancer Society's 2015 Canadian Cancer Statistics publication (released May 2015).<sup>4</sup>

Data for the lower bound estimate of the economic value of a life-year were obtained from a Statistics Canada study, "The Effects of

<sup>3</sup> Health Canada. *Notice of Compliance Database*. Accessed online: <http://www.hc-sc.gc.ca/dhp-mpps/prodpharma/notices-avis/noc-acc/index-eng.php>

<sup>4</sup> Canadian Cancer Society. *Canadian Cancer Statistics 2015*. Accessed online: <http://www.cancer.ca/en/cancer-information/cancer-101/canadian-cancer-statistics-publication/?region=on&gclid=COzK956CgMcCFQEcQodtT8JtQ>

Cancer on Employment and Earnings of Cancer Survivors”, published September 2014.<sup>5</sup>

Estimates for the middle and upper bounds of the economic value of a life-year derived from the results of a scan of commonly used estimates, the World Health Organization (WHO), and Statistics Canada CANSIM tables 380-0063 (GDP) and 051-0001 (population).

## Method

Cancer patients with access to innovative cancer treatment gain health benefits through delayed progression of their disease, maintaining an improved quality of life and extending their lives. Society gains from patients and caregivers who are able to return to work, make economic contributions and otherwise amongst many other important qualitative benefits.

Our method attempts to quantify the aggregate economic value of the incremental survival benefit provided by a cancer drug beyond the first indication. The utility-expansion of a drug during the course of its life-cycle is defined by the benefits it provides to patients from indications approved after the first indication.

This analysis does not explore the concept of “value” that society and patients place on medications for unmet need, especially in advanced cancers. Such quality of life aspects would be in addition to the value of utility-expansion defined and discussed in this study.

The methodology estimates the economic value of the expanded utility of cancer drugs approved by Health Canada during 2004-2014 using three components:

1. Incremental survival benefit for each cancer indication (from clinical trial data for each cancer drug);
2. Value of a life-year; the analysis considers a range consisting of a lower, middle and an upper bound.
3. The annual number of new patients for each relevant cancer type.

### Incremental survival benefit

Incremental survival benefit is determined from clinical trial data for each drug in each of its second and successive approved cancer indications (as of the end of 2014).

The difference in overall survival between a drug and the comparator treatment in the applicable clinical trial is calculated to determine the incremental survival benefit a drug offers in the indication above the current treatment (in months). Where overall survival was not the primary or secondary endpoint in clinical data, the analysis relies on progression-free survival, survival rates or response rates by proxy.

The incremental survival gain of a drug in its second and each subsequent approved cancer indication was stated as a proportion of the 12 months in a year. For example, incremental survival of five months was set to a ratio of 5/12.

<sup>5</sup> Jeon, Sung-Hee (2014). *The Effects of Cancer on Employment and Earnings of Cancer Survivors*. Statistics Canada. Publication 11F0019M, no. 362. Accessed online: <http://www.statcan.gc.ca/pub/11f0019m/11f0019m2014362-eng.htm>

## The value of a life-year

Innovative cancer treatment can extend patients' lives, enable quality of life, and provide patients (and caregivers) with opportunities to maintain their daily activities such as work, relative to absence of innovative treatment. Ascribing an economic value to the life-year of patients is challenging. Quantifying this value is undertaken in the HTA process and in payer decisions, in large part, by means of cost-effectiveness thresholds.

Cost-effectiveness thresholds are generally agreed to be arbitrary and are essentially value judgements based on factors specific to jurisdictions.<sup>6</sup> Studies have produced a range of estimates and payers use various values in their reimbursement decision methodologies.

This analysis relies on three reasonable estimates of the value of a life-year:

1. Upper bound estimate: the World Health Organization (WHO) uses a value based on three-times annual GDP per capita in its cost-effectiveness analysis.<sup>7</sup>
2. Middle bound estimate: \$50,000 is a commonly used value in cost-effectiveness analysis.<sup>8</sup>

<sup>6</sup> Neumann, Peter J. et al (2014). *Updating Cost-Effectiveness — The Curious Resilience of the \$50,000-per-QALY Threshold*. New England Journal of Medicine. 371:796-797. Accessed online:

<http://www.nejm.org/doi/full/10.1056/NEJMp1405158>

<sup>7</sup> World Health Organization. *Cost-effectiveness thresholds*. Accessed online:

[http://www.who.int/choice/costs/CER\\_thresholds/en/](http://www.who.int/choice/costs/CER_thresholds/en/)

<sup>8</sup> Grosse, SD (2008). *Assessing cost-effectiveness in healthcare: history of the \$50,000 per QALY threshold*. Expert Rev Pharmacoecon Outcomes Res. Apr 8(2):165-78. Accessed online:

<http://www.ncbi.nlm.nih.gov/pubmed/20528406>

3. Lower bound estimate: the annual earnings of cancer survivors.

The upper bound estimate of the value of a life-year is based on the 2014 Canadian gross domestic product (at market price) and population statistics from Statistics Canada.

The lower bound of the value of a life-year is directly relevant to the experience of cancer patients in Canada. The value of a life-year is the 2010 earnings of cancer survivors from a 2014 study by Statistics Canada. Using the 2010 earnings, without adjusting for inflation, provides a conservative estimate for the lower bound value of a life-year as of 2015. The Statistics Canada study examined labour market outcomes of cancer survivor using Canadian census microdata, longitudinal personal income tax records, records from the Canadian Cancer Registry and the Vital Statistics Registry.

## New patients by cancer type

The Canadian Cancer Society provides a national-level demographic estimate of the incidence of cancer, by type.

New patients by cancer type represent the potential patient population benefiting from treatment by the cancer drugs in the analysis. The patient population helps determine the value expansion. The estimate of the number of new patients in a year, for each cancer indication comes directly from the Canadian Cancer Society's annual "Canadian Cancer Statistics" publication.<sup>9</sup> The count of new

<sup>9</sup> For gastrointestinal stromal tumours (GIST), the number of new patient cases in a year is not readily available in the Canadian Cancer Society 2015 publication. The estimate comes from a 2013 pCODR review and from the Medical Education Network. *The Management of GIST: Achieving Consensus for Improved*

patient by cancer type is matched to each drug's approved indication.

### Estimating the economic value of the utility-expansion

The economic value expansion of each cancer drug is the sum of the value expansion calculated for each of the second and subsequent approved cancer indications. In each of these indications, the economic value expansion is the multiplicative of the three components described previously: the incremental survival gain, the value of life-year and the annual number of new patients by cancer type.

This multiplicative is done at the lower, middle and upper value of life-year bounds, for each indication and cancer drug. The total potential economic value of the utility-expansion of the cancer drugs is the aggregate of the value for each drug. The Appendix offers a descriptive example of the methodology.

## Findings

### Estimate of the potential economic value in 2015 of the utility-expansion that occurred for cancer drugs approved from 2004 to 2014

The potential economic value of the utility-expansion of the cohort of cancer drugs was estimated based on the incremental survival of the drugs in indications after their initial indication, the population of new cancer

patients in these indications and three life-year values.

The analysis identified 11 cancer drugs approved in Canada during 2004-2014 that subsequently received Health Canada approvals for additional cancer indications (as of the end of 2014). The total number of additional cancer indications is 22. In other words, the 11 cancer drugs in this study provided expanded utility through 22 additional approved indications, beyond their initial approved indications. Table 1 summarizes the drugs and the indications approved by Health Canada.

The number of new cancer patients for 2015, by cancer type for the indications in the study is shown in Table 2. Eight of the additional indications are for innovative therapies treating three of the highest new cases of cancer in Canada each year: lung, colorectal and breast cancer.

Table 3 shows the economic value of the utility-expansion provided by the cancer drugs in the study i.e. the results of the methodology.

The potential value expansion of the 11 cancer drugs in this case study is estimated to be \$1.9 billion to \$8.4 billion annually. The range of the value expansion in Table 3, is based on applying the three values of a life-year to the incremental survival provided by each of the drugs in their additional cancer indications and to the projected number of newly diagnosed cancer patients in 2015 (as described in the Methods section and the Appendix). Note the \$1.9 billion to \$8.4 billion value of utility-expansion does not capture "soft" metrics relating to the quality of life that patients experience from treatment by these drugs.

Care. Accessed online:

<http://www.mednet.ca/en/report/the-management-of-gist-achieving-consensus-for-i.html>.



## The HTA experience with utility-expansion in Canada

Health technology assessments of cancer drugs are conducted by the pan-Canadian Oncology Drug Review (pCODR) and by Institut national d'excellence en santé et en services sociaux for Quebec (INESSS). Assessments by pCODR and INESSS are used by public and private drug insurance plans to guide reimbursement eligibility and conditions.<sup>10</sup>

HTA evaluations are typically done for a specific indication. Drugs that are approved for multiple indications may undergo several HTA evaluations.

The HTA experience of the utility-expansion that occurred in Canada for this study's 11 cancer drugs and their 22 additional cancer indications is as follows:

- From 2004 to 2014, 11 cancer drugs were approved by Health Canada for a first indication that also had subsequent indications approved by Health Canada during the study period. These cancer drugs had 11 first indications and 22 additional subsequent indications approved by Health Canada.
- Of the 11 first indications approved by Health Canada, 9 were reviewed by pCODR (as of August 2015).
- pCODR has recommended funding for 3 of the 11 first indications approved by Health Canada.

- Of the 22 subsequent cancer indications approved by Health Canada, 8 were reviewed by pCODR (as of August 2015).
- pCODR recommended funding for 4 of the additional 22 subsequent indications approved by Health Canada.

## Discussion

Throughout their product life-cycle, innovative drugs provide benefit to patients across multiple indications. Using a case study of cancer drugs, this study quantifies the potential economic value of the utility-expansion (the expansion of uses) that occurs beyond a drug's initial approved indication.

The value expansion is evidenced in a number of cancer drugs that are approved in Canada for multiple cancer indications. With these results, the aim of this study demonstrates the utility-expansion that occurs and how the current HTA process can be enhanced to accommodate the value expansion of health technology over a product life-cycle.

In particular, when a new drug is approved for marketing, HTA evaluations of the drug primarily account for the value demonstrated in the specific indication for which the drug receives its first Health Canada approval. However, an innovative drug provides health and economic returns to patients and society beyond this initial indication. The utility-expansion potential of new cancer treatments – especially immunotherapy medicines – are being researched for use in treating many different types of cancer. Thus, innovation of a drug can be demonstrated in its expanded use over time and this value expansion needs

<sup>10</sup> pCODR has reviewed cancer drugs since 2011. Prior to pCODR, reviews were conducted by the inter-provincial Joint Oncology Drug Review (JODR). There are no publically available documents for the study's 11 drugs reviewed by JODR.

consideration in determining reimbursement recommendations.

Understandably HTA agencies and payers are concerned with sufficient evidence of drugs and managing the budget impact from utility-expansion. Balancing these realities with the health system and cancer patients' needs is challenging.

The evidence and discussion presented in this study offer several extended observations that deserve further consideration and questions that can be further explored.

First, because the HTA process influences reimbursement decisions, methods that capture the benefit of a drug over a longer timeframe may broaden patients' access to treatment that otherwise have limited reimbursement status. In other words, initial HTA evaluations for cancer therapies that are being studied for multiple indications may be enhanced by considering future value expansion in the initial review. This may involve manufacturers providing information on research plans. One specific suggestion is for HTA evaluators and the manufacturer to assess a product's likely indications within a relevant time window and dialogue around how to capture the potential additional value across indications. This approach could offer greater efficiencies (time and costs associated with reviews) as well as enhance certainty for all parties.

Second, the HTA process can encourage, support and facilitate an easier re-submission process for a drug when additional clinical and patient data become available for subsequent indications. Thus for further consideration and development is what areas within this process would enhance the collaborative process between HTA evaluators and manufacturers

about the expanded value of drugs to achieve greater efficiencies in decisions.

Third, access to therapy for the opportunity to maintain quality of life and extend life is of utmost value to patients. Evaluation metrics that are finite are not able to account for differences in benefits that a cancer drug provides to individuals patients, even for the same indication.

Fourth, a potential policy consideration is whether and how the HTA process and payers can move to a flexible pricing approach. For cancer drugs, differential pricing by indication can recognize that the value a drug provides in one indication is different from the value it provides in another. Differential pricing would entail a primary price for indication(s) that shows higher impact and lower price(s) in indications where a drug has a lower impact.<sup>11</sup>

To some extent, differential pricing of drug products already occurs but with little transparency and is difficult to track. How a flexible pricing approach can be practically applied more broadly and transparently to capture utility-expansion requires further policy development.

Further development needs to also consider the mechanism for differential pricing in the context of the multi-step pricing system in Canada, especially the effect of the rules-based pricing regime of the Patented Medicine Prices Review Board (PMPRB). A note on drug pricing process in Canada is provided in Section 2 of the Appendix.

<sup>11</sup> The first mention of the concept that we are aware of is Bach, Peter B. (2014). Indication-Specific Pricing for Cancer Drugs. *Journal of the American Medical Association (JAMA)*. Published online October 3, 2014.



The PMPRB regime essentially establishes one ceiling price per patented drug, regardless of the indication. Actual prices typically fall below this ceiling due to the effects of HTAs and negotiated discounts with payers. Prices can vary by payer as a result. Policy-makers therefore need to consider whether the current pricing regime is sufficiently flexible to accommodate differential pricing-by-indication should a drug later be approved for a subsequent indication that is associated with a utility that justifies a higher price ceiling than the one established for the original indication.

## Cautions and Limitations

In estimating the economic value of the utility-expansion of the cancer drugs the methodology relies on available clinical data and assumptions relating to the cohort of cancer drugs. The assumptions are:

- New patients for a specific cancer type have the same cancer progression profile.
- The number of new patients by cancer type represents the full uptake of the cancer drug for the approved indication in the year.
- All new patients of a cancer type are assumed to be treated with the cancer drug in the study, indicated for that cancer type. The actual patient population for the indication may be smaller than the patient population for the cancer type. For example, a drug where all its indications are for the same cancer type. The same new lung cancer patient count is used in calculating the value expansion in each indication.

- The incremental survival benefit of a drug relative to a comparator treatment group in its clinical trial for an indication is assumed as the survival benefit above current available treatment for the cancer type.

Where overall survival data from clinical trials were not readily available for the indication, the analysis used other primary and secondary endpoints for that indication from the drug's product monograph, as proxies:

- Where time-to-progression in months (TTP) was an endpoint instead of overall survival, TTP months is assumed for survival gains.
- Where 12-month survival rates were endpoints instead of survival months, these rates were applied to new cancer patients as the rate of patients benefiting from the drug treatment during the year.
- Where response rate was an endpoint, the rate is assumed as the proportion of new patients benefiting from the drug treatment. Complete or near complete response rates were also used where available in the clinical data.
- Often when response rates were provided in the clinical trials, 12-month survival rates, additional survival months of responders and response time in months were also provided. The study applied the response rate and additional survival months to the patient population in the methodology. Response time was assumed as a proxy for additional months survived.

# Appendix

## SECTION 1: Example methodology

Cancer Drug A is approved for three cancer indications in Canada. The second and the third indications are the utility-expansion (expansion of uses).

The clinical results for each indication are documented in the Cancer Drug A's product monograph:

- For the second indication: median overall survival of Drug A is 23 months and the median overall survival in the comparator arm is 19 months. The incremental survival gain of Drug A relative to comparator treatment for the second indication is 4 months.
- For the third indication: The endpoints in the clinical trial for the indication are response rate (38%) and survival rate of at year 1 (80%), no comparator treatment group.

The incremental survival gain of Drug A for the second indication is 5/12 of a year. For the third indication, the survival gain is based on response rate of 38% applied to the count of new cancer patients for year, and an 80% survival rate at Year 1 (from clinical trial) is applied to this portion of the calculated patients.

The incremental survival gains in the second and third indications are then applied to the study's lower, middle and upper bounds of the value of a life-year:

- The lower bound is based on Statistics Canada earnings of cancer survivor;

- The middle bound is the frequently cited \$50,000 annual life-year amount;
- The upper bound is the WHO's threshold of 3-times GDP per capita.

The count of new patients for the second indication (lung cancer) is 23,780. The count of new patients for the third indication (a form of lung cancer) is 23,780. The count of new lung cancer patients is from Canadian Cancer Society's annual Canadian Cancer Statistics publication.

The economic value of the utility-expansion of Drug A at the middle bound of the value of a life-year comprised:

- For the second indication:  $(5/12) \times \$50,000 \times 23,780$ .
- For the third indication:  $[(32\% \times 23,780) \times 80\%] \times \$50,000$ .

The economic value expansion is determined for the second and third indication of Drug A at the lower bound (earnings of cancer survivor) and the upper bound (WHO threshold) of the value of a life-year.

The economic value expansion for the second and third indications of Drug A at each of the value of life-year bound are summed with the value of life-year at each bound for other indications of each of the drugs in the study.

The total economic value of the utility-expansion of the cohort of cancer drugs at each life-year bound is the aggregate of the economic value expansion of each drug.

## SECTION 2: Drug pricing regime in Canada

Drug pricing in Canada is broadly determined by global and local economic factors, and further refined by regulatory and negotiated factors. The process for getting a new drug listed as eligible for reimbursement in public drug plans occurs in multiple steps and ultimately determines the actual prices paid by public drug plans:

1. Health Canada certifies that the drug is safe and effective and issues marketing authorization;
2. The Patented Medicine Prices Review Board (PMPRB) certifies that the price of the new drug is not excessive;
3. The Canadian Agency for Drugs and Technology in Health (CADTH) conducts health technology assessments (HTA) of cost-effectiveness and issues reimbursement recommendations to public drug plans. The Common Drug Review (CDR) and pCODR processes are incorporated into CADTH. The Institut national d'excellence en santé et en services sociaux (INESSS) conducts separate HTAs for the province of Quebec.
4. The pan-Canadian Pharmaceutical Alliance is a collaborative effort of the participating provincial and federal governments to collectively negotiate drug prices for reimbursement under public drug plans.

The PMPRB pricing process is particularly bound by a set of rules. According to the PMPRB [*verbatim*]:<sup>12</sup>

### “Scientific Review

The first step in the PMPRB’s regulatory process is a scientific review, which assesses the level of therapeutic improvement of a new patented drug product. A committee of experts known as the Human Drug Advisory Panel also recommends appropriate drug products to be used for comparison. The level of therapeutic improvement of a patented drug is used to determine a ceiling price, known as the Maximum Average Potential Price, at introduction.”

### “Price Review

Patentees are required by law to file information about the prices and sales of their patented drug products in Canada at introduction and then twice a year until the patent expires. The *Patent Act* along with the *Patented Medicines Regulations* set out the filing requirements.

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.

There are five factors used for determining whether a drug product is excessively priced, as outlined in *Section 85* of the Act:

- the prices at which the medicine has been sold in the relevant market
- the prices at which other medicines in the same therapeutic class have been sold in the relevant market
- the prices at which the medicine and other medicines in the same therapeutic class have been sold in countries other than Canada
- changes in the Consumer Price Index
- any other factors that may be set out in regulations”

<sup>12</sup> Patented Medicine Prices Review Board (PMPRB) (2015). URL: <http://www.pmprb-cepmb.gc.ca/home>.

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The analysis, conclusions and opinions expressed in this paper are the authors' own independent research and ideas, and do not necessarily reflect the views of their employers or affiliate organizations. The authors are the sole guarantors of the integrity and originality of the work.

## Open-Access

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**Table 1**  
**Utility-expansion for Cancer Drugs, Approved by Health Canada 2004 to 2014**

	<i>1st Approved Indication</i>	<i>2nd</i>	<i>3<sup>rd</sup></i>	<i>4th</i>	<i>5th</i>	<i>Additional Approved Cancer Indications</i>
<i>Afinitor</i>	kidney	brain	Pancreatic	breast	kidney	4
<i>Alimta</i>	lung*	lung	Lung	lung		3
<i>Avastin</i>	colorectal	lung	brain			2
<i>Eloxatin</i>	colorectal	colon***				1
<i>Erbix</i>	colorectal	head and neck	Colorectal			2
<i>Nexavar</i>	kidney	liver	Thyroid			2
<i>Stivarga</i>	colorectal	GIST				1
<i>Tykerb</i>	breast	breast				1
<i>Velcade</i>	multiple myeloma	multiple myeloma <sup>+</sup>	non-Hodgkin's**	multiple myeloma <sup>+</sup>	non-Hodgkin's**	4
<i>Votrient</i>	kidney	soft tissue				1
<i>Yondelis</i>	ovarian	soft tissue				1
<b>TOTAL</b>	<b>11</b>					<b>22</b>

\*Pleural mesothelioma most often starts in covering of the lungs

+ Velcade's subsequent approved indications for multiple myeloma treat patients with different treatment pathways.

\*\*Mantle cell lymphoma is a rare type of non-Hodgkin's lymphoma. Velcade's subsequent approved indications for Mantle cell lymphoma treat patients with different treatment pathways.

\*\*\* Analysis used available colorectal patient population data; colon population not readily available

**Table 2**  
**New Annual Cancer Patients (For Indications of Cancer Drugs in Case Study)**

	<i>new cases/100,000 (2015)**</i>	<i>actual new cases (2015)*</i>
Lung (NSCLC)	51.9	23,780
multiple myeloma	5.1	2,355
non-Hodgkin's	16.8	7,085
colorectal	49	21,300***
colon	n/a <sup>+</sup>	n/a <sup>+</sup>
brain	6.9	2615
head and neck	n/a	n/a
kidney	12.7	4,980
liver	4.4	1,685
thyroid	14.9	5,040
breast	52.1	23,170
pancreatic	9.3	3,915
ovarian	10.8	2,520
soft tissue	n/a	1,175
GIST		500****

Data: Canadian Cancer Society 2015 publication: <http://www.cancer.ca/en/cancer-information/cancer-101/canadian-cancer-statistics-publication/?region=on>.

Notes: \*From Table A1; \*\* From Table 1.2; \*\*\*From Table A3;

+ The analysis considered colon cancer patients as part of overall colorectal patient population as published by the Canadian Cancer Society;

\*\*\*\* For GIST, the number of new patient cases in a year is not readily available in the Canadian Cancer Society 2015 publication. The estimate comes from a 2013 pCODR review and from URL: <http://www.mednet.ca/en/report/the-management-of-gist-achieving-consensus-for-i.html>



**Table 3**  
**Potential Annual Economic Value of the Utility-expansion**  
**for New Cancer Drugs Approved 2004 to 2014**

Range Estimates, Economic Value of a Life-Year (LY)	Total Value of Utility-expansion in 2015
Low value of LY: \$37,124	\$1,939,867,123
Mid value of LY: \$50,000	\$2,529,686,630
High value of LY: \$166,698	\$8,433,874,037

Based on anticipated number of patients newly diagnosed with cancer in 2015.