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Provincial elections and timing of cancer drug funding

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ABSTRACT

Background Concerns have been raised about the potential influence of political pressures on drug funding decisions. We evaluated the temporal relationship between cancer drug funding and provincial elections in 9 Canadian provinces.

Methods New indications for cancer drugs between January 2003 and December 2012 were identified, and the dates of official provincial funding dates and election dates between 1 January 2003 and 31 December 2014 were retrieved. The probability of drug funding announcements in the 60-day period preceding a provincial election was evaluated using binomial probability distribution analysis.

Results Data from 9 provinces (all Canadian provinces except Quebec) were available. During the period of interest, 69 new indications for 39 individual drugs were identified. Variation in the availability of funding dates was identified. At the time of data collection, 2 provinces did not have data available for all 69 indications. For the 9 provinces, the number of funded indications during the 60-day period preceding an election ranged from 0 to 3; however, no differences in the proportion of indications funded pre-election were identified. Additional analyses also failed to demonstrate any significant associations with the 90-day period before an election, or the 60- and 90-day periods after an election.

Conclusions We observed no clear temporal relationship between provincial election dates and funding decisions in this recent Canadian sample of new indications for cancer drugs.

Key Words Cancer drugs, drug funding, elections, politics

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INTRODUCTION

Cancer drugs are increasing in both number and cost[1]. Internationally, governments face challenges prioritizing funding decisions[2,3]. To ensure fairness, many countries use rigorous processes in an attempt to ensure equitable use of constrained resources[4,5].

In Canada, national evidence-based reviews have been standardized to evaluate the efficacy and cost-effectiveness of new cancer agents[6]. Although evidence of efficacy is necessary, multiple other factors can influence the decision to fund a drug at the provincial level[3,7]. Potential external factors include the influence of media, patient advocates, politicians, and the pharmaceutical industry[7]. Involvement of those various policy actors was discussed in a study examining Ontario's funding of trastuzumab, a cancer drug used to treat breast cancer, compared with a number of other cancer drugs[7].

Despite pressure from multiple stakeholders, there is a public expectation that certain aspects of health policy remain protected from political influences. In Canada, the Canada Health Act supports a near-universal health care system; however, provinces independently make coverage decisions based on local constraints[8]. Furthermore, the Canada Health Act applies to insured health services, defined as physician care and hospital care; drug coverage is not considered an insured health service under the Act. The timing of drug additions to the various provincial formularies can therefore vary, in some cases by years[9].

Speculation has been raised concerning the effect of political forces on health policy decisions[10]. During pre-election campaigning, political parties often use various promises or incentives to win votes from the electorate, including the promise of funding for various resources. Capturing the nuances of political pressure on drug funding decisions is challenging; however, elections

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have been suggested as one quantifiable method[11]. A case study involving dementia medications demonstrated that impending elections appeared to affect the timing of drug funding announcements, despite an established structure for evidence-based decision-making[11].

Cancer drugs in Canada are reviewed through a similar evidence-based review process that includes cost-effectiveness analyses. Before 2007, Canadian provinces and territories had separate regional cancer drug review processes to inform their local funding decisions[9,6]. In 2007, the interim Joint Oncology Drug Review (iJODR) was created to facilitate the implementation of a single drug review process. The iJODR represented an evaluative process in which one province conducted reviews and shared results with the other provinces. After an evaluation of the interim process, the Conference of Deputy Ministers of Health approved the creation of a permanent body in 2010. The pan-Canadian Oncology Drug Review (pCODR) began accepting drug submissions for review in July 2011. This formalized national body conducts reviews on behalf of all provinces and territories except Quebec[6].

Given the highly political nature of cancer drug funding, the association with campaign promises and elections, and evidence of an association between elections and timing of drug funding decisions in Canada, we hypothesized that there would be an association between election dates and cancer drug funding announcements. We therefore evaluated the effect of provincial elections on cancer drug funding decisions by individual Canadian provinces.

METHODS

In this retrospective cohort study, we identified all cancer drugs with a distinct indication and with a Notice of Compliance (NOC) issued by Health Canada between 1 January 2003 and 31 December 2012. The year 2003 was selected as the start year because of a lack, before that year, of consistent data to link NOC dates to specific indications. The 2012 end date was chosen to provide sufficient time after a NOC date for a drug to be reviewed and considered for a provincial formulary.

Drug funding dates in each province for the identified indications and provincial election dates were gathered for the period 1 January 2003 to 31 December 2014. We contacted pCODR to facilitate collection of certain data variables from the provinces; pCODR was blinded to the study objective throughout the proposal development, data collection, and data analysis stages. Quebec was not included in the analysis because that province is not part of pCODR.

Data Sources

Health Canada internal databases were accessed to identify all cancer drugs and indications. The publically available Drug Product Database Online Query tool maintained by Health Canada (http://webprod5.hc-sc.gc.ca/dpd-bdpp/index-eng.jsp) was used to manually corroborate all drug and indication entries. Individual provincial ministries of health, cancer agencies, and pCODR were contacted to obtain drug funding dates by individual province. Contact with provincial ministries of health and cancer agencies was facilitated through pCODR and the pCODR Provincial Advisory Group Working Group. Provincial election dates for the 9 provinces of interest (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Prince Edward Island, and Saskatchewan) from 1 January 2003 to 31 December 2014 were extracted from publicly available Web sites (Table I).

Data Collection Process

Health Canada provided a list of all drugs and associated indications classified as antineoplastic and immunomodulatory. Veterinary entries were excluded. That dataset was manually reviewed against the Drug Product Database Online Query tool to extract NOC dates of interest for each unique indication.

Using a prospectively defined electronic data extraction sheet, 2 individuals (AS and a pCODR staff member, Nianda Penner) independently extracted data. A third individual (pCODR staff member Helen Mai) resolved any discrepancies. Duplicate entries were removed so that the final data set included 1 unique NOC date per drug per unique indication. The electronic drug monographs available through the Drug Product Database Online Query Web site were used to corroborate drug indications. Notice of Compliance entries were removed when the entry concerned various strengths of a drug, a non-cancer drug or indication, a discontinued drug, or replication because of a change in manufacturer or manufacturing process. It was not possible to link an individual indication to a specific NOC date for all older drugs. Drugs with a first NOC date before 1 January 2003 were therefore excluded.

Variable Definitions

Extracted variables of interest included the drug name; drug indication; province; NOC date; submission period (pre-iJODR era, iJODR era, or pCODR era); tumour site; route of administration; provincial funding status; provincial funding date if the drug was funded; provincial election dates; and incumbent party on 1 January 2003 and subsequent election winners.

Statistical Analyses

Before analysis, provincial identifiers were removed, and results were anonymized. Anonymization was necessary to obtain interprovincial collaboration. Descriptive statistics are used to summarize characteristics of the evaluated drugs and indications.

The time from drug funding date to closest provincial election date was calculated in accordance with previously published literature[11]. Funding decisions made in the 60-day period preceding a provincial election were identified. The 60-day period was chosen because that is a typical time interval between the formal announcement of a provincial election and the voting date, and it is representative of the time when political parties most actively campaign to gain voter support.

To establish whether there was a statistically significant change in the probability of a drug funding announcement being made within the 60-day interval before a provincial election, a 1-sample test of binomial probability was performed. The null hypothesis was that

TABLE I Web sites that provide provincial election dates

Province	Web site[a]
British Columbia	http://www.elections.bc.ca/index.php/resource-centre/electoral-history-of-bc/
Alberta	http://www.electionsalberta.ab.ca/Public%20Website/730.htm
Manitoba	http://www.electionsmanitoba.ca/en/Results
Saskatchewan	http://www.elections.sk.ca/election-results/
Ontario	http://www.elections.on.ca/en/resource-centre/elections-results.html
New Brunswick	http://www.electionsnb.ca/content/enb/en/resources/publications/election-results.html
Prince Edward Island	http://www.electionspei.ca/index.php?number=1047265
Newfoundland and Labrador	http://www.elections.gov.nl.ca/elections/ElectionReports/index.html
Nova Scotia	https://electionsnovascotia.ca/election-data/past-results

[a] Accessed 10 February 2015.

the observed probability of a drug funding announcement within the 60-day period preceding an election is not different from the expected probability based on chance only. The expected probability was defined as the probability that a funding announcement would be expected in this period by chance alone; it was calculated by determining the proportion of time an individual province spent in the 60-day pre-election periods between 1 January 2003 and 31 December 2014. Specifically, for each province, the number of provincial elections that took place during the 12-year study period (4380 days) was identified, and the total number of days spent in the 60-day intervals before elections in each province was then determined.

The 1-sample test of a binomial proportion was applied to compare the observed proportion of funding announcements within the 60-day intervals before an election with the null hypothesis value. Table II provides further details of the expected probabilities and the null hypothesis. No attempt was made to censor events or to model them in a time-to-event fashion.

Using a 1-sided alpha of 0.05, the calculated null hypothesis (0.0457 of cancer drug funding decisions would, by chance, fall within the 60 days preceding an election), and the 275 drug funding decisions across the country, our study would have 80% power to detect a higher proportion of drug funding decisions (alternative hypothesis of 0.08) falling within the 60-day period before an election. Additional analyses were conducted in a similar manner for the 90-day period before an election, the 60-day period after an election, and the 90-day period after an election. Statistical significance was 1-sided and defined as $p < 0.05$. The statistical analyses were performed using the IBM SPSS Statistics software application (version 21: IBM, Armonk, NY, U.S.A.). No correction was made for multiple statistical testing.

TABLE II Calculation of expected probability for null hypothesis

Province	Elections during the study period[a] (*n*)	Total days before elections[b] (*n*)	Proportion of election days during the time period[a]
British Columbia	3	180	0.0411
Alberta	3	180	0.0411
Manitoba	3	180	0.0411
Saskatchewan	3	180	0.0411
Ontario	4	240	0.0548
New Brunswick	4	240	0.0548
Prince Edward Island	3	180	0.0411
Newfoundland	3	180	0.0411
Nova Scotia	4	240	0.0548
National	30	1800	0.0457[c]

[a] Study period was 1 January 2003 to 31 December 2014 (that is, 12 years × 365 days = 4380 days, no allowance for leap years).
[b] Calculated as 60 days × number of elections.
[c] Expected probability for the null hypothesis (mean proportion of time spent in the 60-day intervals preceding elections divided by 9—that is, the total number of provinces included).

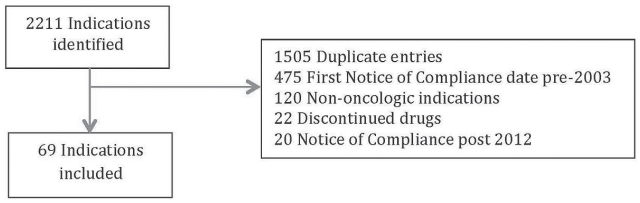

FIGURE 1 Identification of included chemical entities and indications.

RESULTS

Baseline Characteristics

Health Canada identified 2211 indication entries. Excluding duplicate entries, non-cancer indications, discontinued drugs, and drugs with an initial NOC date before 1 January 2003, 69 indications representing 39 unique cancer drugs (chemical entities) remained (Figure 1, Table III). Table IV lists the characteristics of the indications.

Characteristics of Available Provincial Data

The availability of drug funding dates varied for the 9 provinces (Table V). For two provinces (6 and 8), data for all 69 indications were not available at the time of data collection, because a centralized process for record-keeping was not available. Missing data all related to the

TABLE III Indications and drugs included in the analysis

Drug	Indication	NOC date
Abiraterone	■ Metastatic prostate cancer, castrate-resistant, prior docetaxel	27 Jul 2011
Alemtuzumab	■ Pretreated B-cell chronic lymphocytic leukemia (alkylating agents and fludarabine therapy)	30 Nov 2005
	■ Previously untreated B-cell chronic lymphocytic leukemia	27 Jan 2009
Axitinib	■ Metastatic renal cell cancer	12 Jul 2012
Azacitidine	■ Non transplanted myelodysplastic syndrome	23 Oct 2009
Bendamustine	■ Relapsed indolent B-cell non-Hodgkin lymphoma (NHL) who did not respond or who progressed with rituximab [for sake of analysis, assume all NHL (first-line and relapsed)]	24 Aug 2012
	■ Symptomatic chronic lymphocytic leukemia having received no prior treatment	24 Aug 2012
Bevacizumab	■ Metastatic colon cancer	9 Sep 2005
	■ Single agent, for the treatment of patients with glioblastoma after relapse or disease progression, after prior therapy	24 Mar 2010
	■ In combination with carboplatin–paclitaxel chemotherapy regimen, indicated for the treatment of patients with unresectable advanced, metastatic or recurrent nonsquamous non-small-cell lung cancer	27 Mar 2009
Bortezomib	■ Multiple myeloma relapsed after front-line therapy and refractory to the most recent therapy	27 Jan 2005
	■ Progressive multiple myeloma having received at least 1 prior therapy and already having undergone or being unsuitable for stem-cell transplantation	24 Apr 2006
	■ Mantle cell lymphoma relapsed or refractory to at least 1 prior therapy	9 Jun 2008
	■ As part of combination therapy for the treatment of previously untreated multiple myeloma when the patient is unsuitable for stem-cell transplantation	2 Sep 2008
Cabazitaxel	■ In combination with prednisone or prednisolone for the treatment of castration-resistant (hormone-refractory) metastatic prostate cancer previously treated with a docetaxel-containing regimen	16 Jun 2011
Cetuximab	■ EGFR-expressing metastatic colorectal carcinoma refractory to other irinotecan-based chemotherapy regimens; single-agent treatment	9 Sep 2005
	■ In combination with irinotecan for cancers refractory to other irinotecan-based chemotherapy regimens	9 Sep 2005
	■ In combination with radiation therapy for the initial treatment of locally or regionally advanced squamous cell carcinoma of the head and neck	11 Sep 2008
	■ EGFR-expressing *KRAS* wild-type metastatic colorectal carcinoma, in combination with FOLFIRI (irinotecan–5-fluorouracil–leucovorin) for first-line treatment	20 Dec 2012
Clofarabine	■ Relapsed or refractory acute lymphoblastic leukemia	16 Jul 2009
Crizotinib	■ Monotherapy in *ALK*-positive advanced (not amenable to curative therapy) or metastatic non-small-cell lung cancer	25 Apr 2012
Dasatinib	■ Adult chronic-, accelerated-, or blast-phase chronic myelogenous leukemia with resistance or intolerance to prior therapy, including imatinib mesylate	26 Mar 2007
	■ Adult Philadelphia chromosome–positive acute lymphoblastic leukemia with resistance or intolerance to prior therapy	17 Jul 2007
	■ Newly diagnosed adult Philadelphia chromosome–positive chronic myeloid leukemia in the chronic phase	19 Jul 2011
Degarelix	■ Advanced hormone-dependent prostate cancer where androgen deprivation is warranted	16 Nov 2009
Eribulin	■ Metastatic breast cancer previously treated with at least 2 chemotherapeutic regimens for metastatic disease; prior therapy should have included an anthracycline and a taxane administered in either the adjuvant or metastatic setting	14 Dec 2011
Erlotinib	■ Monotherapy for the treatment of locally advanced or metastatic non-small-cell lung cancer after failure of at least 1 prior chemotherapy regimen, when EGFR expression status is positive or unknown	7 Jul 2005
	■ As maintenance monotherapy for locally advanced or metastatic non-small cell lung cancer achieving stable disease after 4 cycles of standard platinum-based first-line chemotherapy	11 Mar 2011
	■ Monotherapy for the first-line treatment of locally advanced (stage IIIB) non-small-cell lung cancer not amenable to curative therapy or metastatic disease (stage IV), with *EGFR* activating mutations	20 Jul 2012
Everolimus	■ Metastatic renal cell carcinoma of clear cell morphology, after failure of initial treatment with either of the VEGF receptor tyrosine kinase inhibitors sunitinib or sorafenib	14 Dec 2009
	■ Children 3 years of age or older with subependymal giant cell astrocytoma associated with tuberous sclerosis complex who have demonstrated serial growth, who are not candidates for surgical resection, and for whom immediate surgical intervention is not required, at a starting dose of 2.5 mg, 5 mg, or 7.5mg once daily	30 Jun 2011
	■ Progressive neuroendocrine tumours of pancreatic origin in unresectable, locally advanced, or metastatic disease	2 Feb 2012

TABLE III Continued

Drug	Indication	NOC date
Fulvestrant	■ Hormonal treatment of locally advanced or metastatic breast cancer in postmenopausal women, regardless of age, who experience disease progression after prior antiestrogen therapy	17 Feb 2004
Gefitinib	■ First-line treatment of patients with locally advanced (not amenable to curative therapy) or metastatic non-small-cell lung cancer who have activating mutations of the EGFR tyrosine kinase inhibitor	18 Dec 2009
Histrelin	■ Implant for metastatic prostate cancer; palliative treatment of hormone-dependent advanced prostate cancer [stage M1 (TNM) or stage D2 (American Urological Association)]	10 Mar 2006
Ipilimumab	■ Unresectable or metastatic melanoma after failure of or intolerance to other systemic therapy for advanced disease	1 Feb 2012
Lapatinib	■ In combination with capecitabine for the treatment of advanced or metastatic breast cancer overexpressing ErbB2 [human epidermal growth factor receptor 2 (HER2)] and progressing after taxanes, anthracycline, and trastuzumab before therapy start	15 May 2009
	■ In combination with letrozole for the treatment of postmenopausal hormone receptor–positive metastatic breast cancer overexpressing the ErbB2 (HER2) receptor, when endocrine therapy is considered suitable	20 Sep 2010
Lenalidomide	■ Transfusion-dependent anemia resulting from low- or intermediate-risk myelodysplastic syndromes associated with a 5q deletion cytogenetic abnormality, with or without additional cytogenetic abnormalities	17 Jan 2008
	■ In combination with dexamethasone, for the treatment of multiple myeloma patients who have received at least one prior therapy	3 Oct 2008
Methyl aminolevulinate (aminolevulinic acid)	■ Superficial basal cell cancer	26 Feb 2009
Nab-paclitaxel	■ Metastatic breast cancer	7 Jun 2006
Nelarabine	■ T-Cell acute lymphoblastic leukemia and T-cell lymphoblastic lymphoma with no response or with relapse after treatment with at least 2 chemotherapy regimens	22 Sep 2007
Nilotinib	■ Accelerated-phase adult Philadelphia chromosome–positive chronic myeloid leukemia resistant to or intolerant of at least 1 prior therapy, including imatinib	9 Sep 2008
	■ Chronic-phase adult Philadelphia chromosome–positive chronic myeloid leukemia resistant to or intolerant of at least 1 prior therapy, including imatinib	22 Jul 2010
	■ Newly diagnosed adult Philadelphia chromosome–positive chronic myeloid leukemia in chronic phase	22 Jun 2011
Oxaliplatin	■ In combination with 5-fluorouracil and leucovorin as treatment for metastatic colorectal cancer	15 Jun 2007
	■ In combination with infusional 5-fluorouracil and leucovorin as adjuvant treatment for stage III (Dukes C) colon cancer after complete resection of the primary tumour	15 Jun 2007
Panitumumab	■ As monotherapy for the treatment of EGFR-expressing metastatic colorectal carcinoma with non-mutated (wild-type) *KRAS* after failure of fluoropyrimidine-, oxaliplatin-, and irinotecan-containing chemotherapy regimens	3 Apr 2008
Pazopanib	■ Metastatic renal cell (clear cell) carcinoma having received no prior systemic therapies or having received prior treatment with cytokines for metastatic disease	27 May 2010
	■ Selected subtypes of adult advanced soft-tissue sarcoma having received prior chemotherapy for metastatic disease or having progressed within 12 months after adjuvant or neoadjuvant therapy (in the pivotal phase III study in soft-tissue sarcoma, disease progression had to have occurred during or after an anthracycline-based regimen, or an intolerance to anthracycline-based therapy had to have been demonstrated)	12 Jul 2012
Pemetrexed	■ First-line treatment of malignant mesothelioma	21 May 2004
	■ Monotherapy as a treatment option for patients with locally advanced or metastatic non-small-cell lung cancer after prior chemotherapy	11 Jan 2007
	■ In combination with cisplatin therapy for the initial treatment of locally advanced or metastatic non-small-cell lung cancer other than predominantly squamous cell histology in the presence of a good performance status	2 Sep 2008
	■ Maintenance treatment of locally advanced or metastatic nonsquamous non-small-cell lung cancer, in the presence of a good performance status, without disease progression, immediately after 4 cycles of first-line platinum doublet chemotherapy, excluding pemetrexed	11 May 2010
Ruxolitinib	■ Splenomegaly or its associated symptoms in adult primary myelofibrosis (also known as chronic idiopathic myelofibrosis), post–polycythemia vera myelofibrosis, or post–essential thrombocythemia myelofibrosis	19 Jun 2012
Sorafenib	■ Locally advanced or metastatic renal cell (clear cell) carcinoma after failure of prior cytokine therapy or when such therapy is unsuitable	28 Jul 2006
	■ Unresectable hepatocellular carcinoma	28 Jan 2008

TABLE III Continued

Drug	Indication	NOC date
Sunitinib	■ Gastrointestinal stromal tumour after failure of imatinib mesylate treatment because of resistance or intolerance	26 May 2006
	■ Metastatic renal cell carcinoma of clear cell histology after failure of cytokine-based therapy or when intolerance to such therapy is considered likely	17 Aug 2006
	■ Metastatic renal cell carcinoma of clear cell histology	22 Jun 2006
	■ Unresectable locally advanced or metastatic well-differentiated pancreatic neuroendocrine tumours, where disease is progressive	05 Jul 2011
Temsirolimus	■ Metastatic renal cell cancer	21 Dec 2007
Thalidomide	■ In combination with melphalan and prednisone for previously untreated multiple myeloma	4 Aug 2010
Trabectedin	■ Platinum-sensitive ovarian cancer, after failure of 1 first-line platinum-based chemotherapy regimen, including adjuvant therapy, when another platinum-based chemotherapy is not expected to provide a benefit, or the patient is ineligible or not willing to receive retreatment	13 May 2010
	■ Metastatic liposarcoma or leiomyosarcoma after failure of prior anthracycline and ifosfamide chemotherapy	14 Jul 2011
Vandetanib	■ Symptomatic or progressive adult medullary thyroid cancer (unresectable locally advanced or metastatic disease)	12 Jan 2012
Vemurafenib	■ Monotherapy for *BRAF* V600 mutation–positive unresectable or metastatic melanoma	15 Feb 2012
Vorinostat	■ Cutaneous manifestations of advanced cutaneous T-cell lymphoma (progressive, persistent, or recurrent disease after prior systemic therapies)	11 Jun 2009

NOC = Notice of Compliance; EGFR = epidermal growth factor receptor; VEGF = vascular endothelial growth factor.

pre-pCODR period, and all affected drugs were intravenous medications. Variation between the 9 provinces in the time to initial funding was identified. A funding date from more than 1 province was available for 55 indications. When more than 1 province provided a funding date, the duration from the earliest funded date to the latest funded date for an indication ranged from 0 to 3469 days (median: 646 days).

Influence of Elections

For the 9 provinces overall, the proportion of indications that were funded during the 60-day period preceding an election was low. For the individual provinces, the number of indications funded during the 60-day period preceding an election ranged from 0 to 3; however, a statistically significant increase in the proportion of indications funded in the 60 days before an election was not identified (Table VI). A similar analysis conducted for the 90-day period preceding an election, the 60-day period after an election, and the 90-day period after an election also did not demonstrate any statistically significant increases in the proportion of indications funded, with the exception of 1 province in the 90-day period after an election (Tables VII–IX).

No similarities between the provinces were found with respect to the drugs that were funded in the 60-day period preceding an election. Across Canada, a total of 7 different indications were funded during such a period. Of those 7 indications, 2 were funded in the iJODR era, and 5 in the pCODR era.

DISCUSSION

Our study did not produce any evidence that provincial elections systematically influence funding announcements for cancer drugs in Canada. Although provinces varied with respect to the number of drugs funded immediately preceding an election, the proportion of drugs funded was not greater than the proportion anticipated because of chance alone. Given the previously identified concern about elections influencing drug funding announcements in specific cases[11], that negative finding provides some reassurance.

Yet despite the reassurance, concerns persist about cancer drug funding decisions. Provincial elections represent one relatively obvious form of political pressure; the potential for other forms of political influence to affect cancer drug funding decisions is difficult to rule out. Drug funding remains a highly political topic, subject to lobbying from many stakeholders, including patient advocacy groups and pharmaceutical companies[7]. Those factors do not operate in isolation, and various stakeholders and the media likely have an interdependent relationship with respect to the drug funding issue[7,12]. The complex interplay of those multiple factors is considerably more difficult to quantify and to study than are the dates of provincial elections.

Government action is necessary to produce outcomes that individuals cannot produce for themselves[10]. From the perspective of policymakers, "problems" are conditions that members of the public find unacceptable and for which change is desired[13]. Translation of any health condition into a political problem occurs through the mobilization of individuals who recognize that their personal needs are shared by others and who subsequently demand action from public officials. Political action can be induced through public opinion, emergence of social movements, interest group mobilization, or voting[10]. Strategic policy agenda–setting and innovative seizing of opportunities by policy entrepreneurs will therefore continue to affect cancer drug funding.

The rigorous and time-intensive review process for cancer drugs in Canada might explain why more drug funding approvals were not identified in the chosen 60-day window. Few data to evaluate the length of the drug review process before the implementation of pCODR in 2011 are available. The length of the process might render manipulation for political ends difficult. Alternatively, a lengthy drug review process with multiple stages might allow for increased manipulation, because a consistently short review process arguably provides fewer opportunities for influence. It is unclear how the implementation of pCODR might have influenced our results, because the number of drugs identified in the 60-day window before an election was too small to conduct subgroup analyses. The establishment in 2010 of the pan-Canadian Pharmaceutical Alliance (http://www.pmprovincesterritoires.ca/en/initiatives/358-pan-canadian-pharmaceutical-alliance) to lower drugs costs and increase affordability could further influence the process in unknown ways.

TABLE IV Characteristics of the indications studied

Characteristic	Value [*n* (%)]
Indications reviewed	69 (100)
Chemical entities reviewed	39
Route of administration	
Oral	33 (48)
Intravenous	27 (39)
Subcutaneous	7 (10)
Intramuscular	1 (1)
Topical	1 (1)
Submission Period	
Pre-iJODR	10 (14)
iJODR	43 (62)
pCODR	16 (23)
Issue date of Notice of Compliance	
2003–2005	8 (12)
2006–2008	23 (33)
2009–2011	26 (38)
2012	12 (17)
Tumour group	
Hematologic	22 (32)
Lung	10 (14)
Gastrointestinal	10 (14)
Renal	8 (12)
Breast	5 (7)
Prostate	4 (6)
Dermatologic	3 (4)
Sarcoma	3 (4)
Head and neck	1 (1)
Ovarian	1 (1)
Thyroid	1 (1)
Central nervous system	1 (1)

iJODR = Interim Joint Oncology Drug Review; pCODR = pan-Canadian Oncology Drug Review

TABLE V Availability of data from the assessed provinces

Province ID	Indications		
	Data available	Funded	Funding date available
1	69	51	50
2	69	42	42
3	69	56	47
4	69	48	15
5	69	48	46
6	42	27	10
7	69	24	18
8	40	25	17
9	69	46	30

Although our study demonstrates that a systematic use of political influence via elections is not occurring, published evidence has shown that, in certain situations, politicization affects cancer drug funding[7]. How health care issues are defined and recognized within existing social conditions and policies becomes increasingly important in ensuring adequate availability of effective drugs for oncology patients. The ability to ensure that issues of interest are on the policy agenda and are framed in a manner to allow positive funding decisions calls for the involvement of various stakeholders. Given that few studies have evaluated the effect of politicization on cancer drug funding, ongoing evaluation of external factors affecting drug funding decisions is necessary.

Limitations of our study include our inability to capture all the nuances that contribute to a drug funding decision. For example, we were unable to capture the effect of lobbying by manufacturers and patient advocacy groups. There is also a lack of transparency in negotiations between provincial governments and manufacturers—negotiations that undoubtedly shape final funding decisions. Additionally, the date of funding recorded in provincial formularies can be different from the date of the funding decision. The dates of funding decisions were not consistently available for all provinces; any relationship between strategic funding decisions and elections could not, therefore, be assessed. Any times lapses between funding decisions and subsequent funding announcements would not be captured in our study. It is a point worth highlighting that every drug funding decision is unique in terms of the disease involved, the alternative treatments available, and the costs and overall budget impact of the new drug being considered for funding. The relatively small sample size in our study is another limitation; however, a larger number of observations does not yet exist. The small sample size might prevent associations from being identified and limits the possibility of undertaking a multivariable analysis evaluating potentially explanatory variables (such as health spending per capita). It is also unclear how a "conditional approval" status rendered by pCODR affects provincial funding decisions, adding another layer of complexity to the interpretation of our results.

Despite those limitations, our study evaluates a large number of cancer drug indications relative to election timing. Furthermore, by evaluating multiple drug classes over a 12-year period, the generalizability of our results is increased.

CONCLUSIONS

We found no evidence of a systematic bias to fund cancer drugs near recent provincial elections. Despite that reassuring finding, further studies into the effects of politics and agenda-setting on cancer drug funding is necessary to ensure that priority-setting remains a legitimate, transparent, and fair process.

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TABLE VI Proportion of indications funded 60 days before an election

(A) Provincial ID	Indications (*n*)		(D) Elections (*n*)	(E) Total days before elections[a]	(F) Proportion of election days during the time period[b]	(G) Proportion of funded indications[c]	(H) *p* Value
	(B) Funding date available	(C) Funded within the 60 days preceding an election					
1	50	0	3	180	0.0411	0.0000	1.00
2	42	2	3	180	0.0411	0.0476	0.52
3	47	1	3	180	0.0411	0.0213	0.86
4	15	0	3	180	0.0411	0.0000	1.00
5	46	3	4	240	0.0548	0.0652	0.47
6	10	0	4	240	0.0548	0.0000	1.00
7	18	0	3	180	0.0411	0.0000	1.00
8	17	0	3	180	0.0411	0.0000	1.00
9	30	1	4	240	0.0548	0.0333	0.82
National	275	7	30	1800	0.0457	0.0255	0.97

[a] Calculated as (D) × 60 days.
[b] Calculated as the total days comprising the 60 days before all elections, divided by the total days during the period of interest [that is, (E) / 4380]. Denominator reflects the total days in 2003–2014 (12 years × 365 days = 4380 days, no allowance for leap years). National row is calculated as the total days comprising the 60 days before all elections, divided by total number of days in period of interest, multiplied by the number of provinces [that is, (E) / 4380 × 9].
[c] Calculated as the indications funded within the 60 days preceding an election, divided by indications with funding dates [that is, (C) / (B)].

TABLE VII Proportion of indications funded 90 days before an election

(A) Provincial ID	Indications (*n*)		(D) Elections (*n*)	(E) Total days before elections[a]	(F) Proportion of election days during the time period[b]	(G) Proportion of funded indications[c]	(H) *p* Value
	(B) Funding date available	(C) Funded within the 90 days preceding an election					
1	50	0	3	270	0.0616	0.0000	1.00
2	42	4	3	270	0.0616	0.0952	0.26
3	47	1	3	270	0.0616	0.0213	0.95
4	15	0	3	270	0.0616	0.0000	1.00
5	46	5	4	360	0.0822	0.1087	0.32
6	10	0	4	360	0.0822	0.0000	1.00
7	18	0	3	270	0.0616	0.0000	1.00
8	17	0	3	270	0.0616	0.0000	1.00
9	30	3	4	360	0.0822	0.1000	0.45
National	275	13	30	2700	0.0685	0.0473	0.94

[a] Calculated as (D) × 90 days.
[b] Calculated as the total days comprising the 90 days before all elections, divided by the total days during the period of interest [that is, (E) / 4380]. Denominator reflects the total days in 2003–2014 (12 years × 365 days = 4380 days, no allowance for leap years). National row is calculated as the total days comprising the 90 days before all elections, divided by total number of days in period of interest, multiplied by the number of provinces [that is, (E) / 4380 × 9].
[c] Calculated as the indications funded within the 90 days preceding an election, divided by indications with funding dates [that is, (C) / (B)].

TABLE VIII Proportion of indications funded 60 days after an election

(A) Provincial ID	Indications (*n*)		(D) Elections (*n*)	(E) Total days after elections[a]	(F) Proportion of election days during the time period[b]	(G) Proportion of funded indications[c]	(H) *p* Value
	(B) Funding date available	(C) Funded within the 60 days after an election					
1	50	4	3	180	0.0411	0.0800	0.15
2	42	1	3	180	0.0411	0.0238	0.83
3	47	1	3	180	0.0411	0.0213	0.86
4	15	1	3	180	0.0411	0.0667	0.47
5	46	4	4	240	0.0548	0.0870	0.24
6	10	0	4	240	0.0548	0.0000	1.00
7	18	0	3	180	0.0411	0.0000	1.00
8	17	0	3	180	0.0411	0.0000	1.00
9	30	2	4	240	0.0548	0.0667	0.49
National	275	13	30	1800	0.0457	0.0473	0.49

[a] Calculated as (D) × 60 days.
[b] Calculated as the total days comprising the 60 days after all elections, divided by the total days during the period of interest [that is, (E) / 4380]. Denominator reflects the total days in 2003–2014 (12 years × 365 days = 4380 days, no allowance for leap years). National row is calculated as the total days comprising the 60 days after all elections, divided by total number of days in period of interest, multiplied by the number of provinces [that is, (E) / 4380 × 9].
[c] Calculated as the indications funded within the 60 days after an election, divided by indications with funding dates [that is, (C) / (B)].

TABLE IX Proportion of indications funded 90 days after an election

(A) Provincial ID	Indications (*n*)		(D) Elections (*n*)	(E) Total days after elections[a]	(F) Proportion of election days during the time period[b]	(G) Proportion of funded indications[c]	(H) *p* Value
	(B) Funding date available	(C) Funded within the 90 days after an election					
1	50	7	3	270	0.0616	0.1400	0.03
2	42	3	3	270	0.0616	0.0714	0.48
3	47	1	3	270	0.0616	0.0213	0.95
4	15	1	3	270	0.0616	0.0667	0.61
5	46	4	4	360	0.0822	0.0870	0.53
6	10	0	4	360	0.0822	0.0000	1.00
7	18	0	3	270	0.0616	0.0000	1.00
8	17	0	3	270	0.0616	0.0000	1.00
9	30	2	4	360	0.0822	0.0667	0.72
National	275	15	30	2700	0.0685	0.0545	0.85

[a] Calculated as (D) × 90 days.
[b] Calculated as the total days comprising the 90 days after all elections, divided by the total days during the period of interest [that is, (E) / 4380]. Denominator reflects the total days in 2003–2014 (12 years × 365 days = 4380 days, no allowance for leap years). National row is calculated as the total days comprising the 90 days after all elections, divided by total number of days in period of interest, multiplied by the number of provinces [that is, (E) / 4380 × 9].
[c] Calculated as the indications funded within the 90 days after an election, divided by indications with funding dates [that is, (C) / (B)].

CONFLICT OF INTEREST DISCLOSURES

We have read and understood *Current Oncology*'s policy on disclosing conflicts of interest, and we declare the following interests: SSG is a member of the Committee to Evaluate Drugs review process, and KKWC is a member of the pCODR Expert Review Committee and co-director of the Canadian Centre for Applied Research in Cancer Control.

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