

CANCER RESEARCH INVESTMENT IN CANADA, 2008–2012

THE CANADIAN CANCER
RESEARCH ALLIANCE'S
SURVEY OF GOVERNMENT
AND VOLUNTARY SECTOR
INVESTMENT IN CANCER
RESEARCH IN 2012



Canadian Cancer Research Alliance • Alliance
canadienne pour la recherche sur le cancer



MARCH 2015

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Suggested Citation:

Canadian Cancer Research Alliance (2015). *Cancer Research Investment in Canada, 2008–2012: The Canadian Cancer Research Alliance's Survey of Government and Voluntary Sector Investment in Cancer Research in 2012*. Toronto: CCRA.

© Canadian Cancer Research Alliance, 2015
ISSN 1918-0691 (print) / ISSN 1918-0705 (PDF)

Aussi offert en français sous le titre : Investissements en matière de recherche sur le cancer au Canada en 2008–2012 : Enquête de l'Alliance canadienne pour la recherche sur le cancer sur les investissements effectués dans la recherche sur le cancer par les organismes gouvernementaux et non gouvernementaux en 2012.

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ACKNOWLEDGEMENTS

Production of this report has been made possible through a financial contribution from Health Canada, through the Canadian Partnership Against Cancer. The views expressed herein represent the views of the Canadian Cancer Research Alliance.

The Canadian Cancer Research Survey relies on the participation of many organizations. In alphabetical order, we would like to thank Alberta Cancer Foundation, Alberta Innovates – Health Solutions, Brain Tumour Foundation of Canada, Breast Cancer Society of Canada, C¹⁷ Research Network, Canada Foundation for Innovation, Canada Research Chairs Program, Canadian Association of Radiation Oncology, Canadian Breast Cancer Foundation, Canadian Cancer Society, Canadian Institutes of Health Research, Canadian Partnership Against Cancer, Canary Foundation of Canada, CancerCare Manitoba, Cancer Care Nova Scotia, Cancer Care Ontario, Cancer Research Society, Cole Foundation, Fonds de recherche du Québec – Santé, Genome Canada, Michael Smith Foundation for Health Research, National Research Council of Canada, Natural Sciences and Engineering Research Council, New Brunswick Health Research Foundation, Newfoundland and Labrador Centre for Applied Health Research, Networks of Centres of Excellence, Nova Scotia Health Research Foundation, Ontario Institute for Cancer Research, Ontario Ministry of Research and Innovation, Ovarian Cancer Canada, Pancreatic Cancer Canada, Pediatric Oncology Group of Ontario, PROCURE, Prostate Cancer Canada, Public Health Agency of Canada, Quebec Breast Cancer Foundation/ Fondation du cancer du sein du Québec, Research Manitoba, Saskatchewan Cancer Agency, Saskatchewan Health Research Foundation, Social Sciences and Humanities Research Council, The Kidney Foundation of Canada, The Leukemia & Lymphoma Society of Canada, and The Terry Fox Foundation. The survey also includes information from the federal government's Indirect Costs Program and the Canadian Cancer Society-funded NCIC Clinical Trials Group.

A special note of appreciation to Ms Barb Hiscock, former Director of Research Administration at the Alberta Cancer Board, who undertook the work to provide preliminary appropriations of the historical data on Alberta cancer research funding.

Kim Badovinac, who managed this project, prepared this report with the invaluable advice and expertise provided by Drs. Stuart Edmonds (Prostate Cancer Canada), Elizabeth Eisenhauer (Canadian Partnership Against Cancer/ Canadian Cancer Research Alliance), Robin Harkness (Canadian Partnership Against Cancer/Canadian Cancer Research Alliance), Jim Hudson (Consultant), Jacques Magnan (Canadian Partnership Against Cancer) and Christine Williams (Canadian Cancer Society). This report was designed by Unified Marketing Communications of Toronto.

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MESSAGE FROM THE CHAIRS



Elizabeth A. Eisenhauer, MD, FRCPC, is the Expert Lead of CCRA and Partnerships for the Canadian Partnership Against Cancer, Head and Professor, Department of Oncology, Queen's University, and Program Medical Director, Oncology, Kingston General Hospital.



Christine Williams, PhD, is the Vice President of Research and Policy for the Canadian Cancer Society.

The CCRA annual survey of investment in cancer research provides valuable insights into the nature of cancer research funding in Canada. This report updates our series with 2012 data and also examines the trends in cancer research investment that have occurred since 2008. Captured in this report are the cancer research investments from 42 organizations, the most comprehensive scan of funding that we have reported to date.

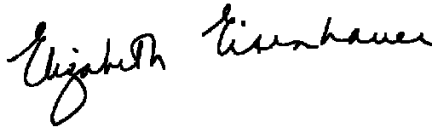
In 2012, there was \$541.6M invested in cancer research from data contributors and their partners. While there was a 15% increase in the investment from 2008 to 2009, the investment from 2009 to 2012 changed very little. Funding from federal and provincial government sources reflected the same ebb and flow as the overall investment, but for the voluntary sector as a whole, there was a year-upon-year increase in investment. As we have previously reported, treatment research surpassed research focused on cancer biology. An upward shift in focused investment (i.e., investment in funding programs focused on specific cancer sites and/or areas of research) provided by both national and regional funders is another key trend captured in this report.

In terms of our other activities, the past year has been busy with development of a new CCRA strategic plan, which will be released in the spring, and the planning for our third Canadian Cancer Research Conference, which will be held in Montreal from November 8 to 10, 2015.

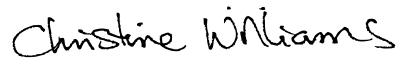
The Canadian Clinical Trials Network (3CTN), our pan-Canadian initiative to improve the efficiency and quality of clinical trials in Canada, has moved beyond the planning phase

with the financial support from a number of CCRA members. At the heart of this initiative is evidence that institutions with active clinical research programs have better patient outcomes for all patients whether or not they are enrolled in clinical trials. These data suggest that a vigorous clinical trials program is vital to accelerating the uptake of new knowledge on treatments and standards of care throughout a health care organization, with the ultimate beneficiaries being the patients.

In closing, we would like to thank the CCRA Board for its leadership and engagement and members and other organizations for their ongoing commitment to the pan-Canadian cancer research strategy and the collaborative process, a key ingredient to successfully accelerating discovery and maximizing impact on cancer control in Canada.



Elizabeth A. Eisenhauer, MD, FRCPC
Co-Chair, CCRA



Christine Williams, PhD
Co-Chair, CCRA

1. INTRODUCTION

1.1 WHAT IS THE CANADIAN CANCER RESEARCH SURVEY?

The Canadian Cancer Research Survey (CCRS) was the first collaborative activity undertaken by the Canadian Cancer Research Alliance (CCRA). The project commenced in the fall of 2005 with the hiring of a project manager who was tasked with compiling information for the member organizations on the nature and quantity of cancer research funding in Canada. The initial activities involved the creation of a relational database, development and adoption of classification systems for data reporting, and development of reporting conventions and data validation processes.

The first report published in the fall of 2007 captured funding data for 2005 from 19 organizations/programs. Since that time, six additional annual investment reports and nine reports on investment in specific areas of research of interest to the research funding community have been released.

This report is the eighth annual report and focuses on the five-year period, 2008 to 2012.

1.2 WHAT'S NEW IN THIS REPORT?

This report varies from others released for the reasons cited below.

- Partner funding for the Canadian Partnership for Tomorrow Project has been included. In previous reports, only the contribution from the Canadian Partnership Against Cancer was included. This more fully captures the total investment in this project.
- Project funding previously reported under “Alberta Cancer” has been attributed to either Alberta Cancer Foundation or Alberta Innovates – Health Solutions (AIHS). This change affects sector-level analysis as the Alberta Cancer Foundation funding is now included under the voluntary sector rather than the provincial government sector. These figures are provisional estimates and will be verified by Alberta Cancer Foundation.
- This report includes two new contributors: Breast Cancer Society of Canada and the Cole Foundation. Both organizations furnished data for all years captured in the CCRS.
- No 2012 data was available from the National Research Council of Canada (NRC).¹
- The Canary Foundation of Canada no longer exists (its registration as a charity was voluntarily revoked in 2012). Its investment is now subsumed under ‘Other charitable organizations.’

As a result, previous reports will not be entirely comparable.

1. Because NRC is the process of redesigning internal protocols, data on cancer-related projects for 2012 were unavailable and could not be provided for this report.

The reader is urged to peruse the Methodology chapter, which details the reporting conventions used in the main section of the report. Analyses are descriptive in nature, and, by design, the report contains many tables and figures rather than extensive narrative. Alphabetical order has been used when reporting data by organization and cancer site. Provincial breakdowns are ordered from west to east coast. Appendix A provides a list of important abbreviations.

1.3 REPORT SCOPE AND LIMITATIONS

While all major cancer research funders from the governmental and voluntary sectors are included (i.e., these are, for the most part, funders that offer open competitions and support researchers at more than one organization), this report does not include the cancer research investment of the BC Cancer Foundation, institution-specific foundations (e.g., hospital foundations), federal and provincial government programs for which health research is only a small component of their funding, or industry sponsored R&D, although some of this investment is reflected under partnered/leveraged funding. In addition, we have not included funding that researchers working in Canadian institutions receive from organizations outside Canada.

Table 1.1.1 lists estimates of the amounts of research funding captured by the funding sources not included in this report. According to these approximations, the CCRS at a total of \$2,969.5M for the 2008 to 2012 period, captures at least 65% of the total (all sources) investment in cancer research funding in Canada.

TABLE 1.1.1

ESTIMATED CANCER RESEARCH INVESTMENT FROM SOURCES NOT CAPTURED IN THE CANADIAN CANCER RESEARCH SURVEY (CCRS), 2008 TO 2012

Funder	Estimated investment (\$M)	Quality of Estimate	Data Source and Assumptions
BC Cancer Foundation	Less than 80	Fair	\$88.3M in support for research and enhancements to patient care reported in annual reports for fiscal years 2008/09 to 2012/13 (research figures not separately reported).
Hospital foundations	~350	Fair	Princess Margaret Cancer Foundation, the largest hospital foundation in Canada, reported \$279.3M for fiscal years 2009/10 to 2013/14 for equipment, research, education and patient care for the Princess Margaret Cancer Centre and the Ontario Cancer Institute. There is a lack of information about cancer-specific research funding from other hospital foundations and some foundation support is already included in the investment figures in this report under the "Other charitable organization."
Other federal agencies	~5	Poor	Some support has been provided to cancer research organizations. Programs include the Western Diversification Program, Atlantic Innovation Fund, and the International Science and Technology Partnerships Program through the Foreign Affairs and International Trade Canada.
Other provincial agencies	~10	Poor	Some leveraged funding for programs such as the Ontario Centres of Excellence program, the Quebec indirect costs programs, etc. Amounts unknown.
Industry	1,129.5	Poor	There is no publicly available data. This estimate represents 20% of the total \$5,647M R&D expenditures by all patentees for years 2008 to 2012 as reported by the Patented Medicines Prices Review Board in its 2012 annual report.
Funders outside Canada	105.1	Good	Based on a scan of 14 funding organizations in the U.S. and U.K. Data come from the International Cancer Research Partnership (ICRP) and from public sources for organizations that are not part of ICRP.
TOTAL	Less than 1,679.6		

2. METHODOLOGY

This chapter provides a very detailed account of how data are captured and reported within the CCRS. This technical information may not be of interest to the general reader so the list below highlights the features of the CCRS that are critical to understanding the presented analyses.

- There are 42 organizations included in the CCRS and data from each organization covers the entire 2005 to 2012 period, although this report focuses on 2008 to 2012.
- Year refers to a calendar period (January 1 to December 31).
- The amount a research project is funded is pro-rated over its duration.
- For a project where the research deals with more than cancer, the portion of the research focused on cancer is estimated and the project budget is adjusted to reflect the cancer portion.
- Projects are classified in terms of area of research and cancer site on the basis of internationally used classifications. Projects are also grouped by type of funding mechanism.
- Investment shown for a funder does not include leveraged or partnered funding.
- Analyses by geographic region are based on the institutional affiliation of the nominated principal investigator (PI).
- Investment figures are not adjusted for inflation.

2.1 PARTICIPATING ORGANIZATIONS

The CCRS is composed of peer-reviewed cancer research projects funded by 42 organizations/programs within the federal government, provincial government, and voluntary sectors. It includes organizations that fund only cancer research (e.g., Canadian Cancer Society (CCS)) and organizations that fund all types of health research (e.g., Nova Scotia Health Research Foundation), and general research/technology (e.g., Natural Sciences and Engineering Research Council (NSERC)). Current names are used for organizations that have undergone name changes and will vary from previous reports. This report focuses on research projects with start dates before December 31, 2012 and end dates after January 1, 2008. Appendix B lists all CCRS participating organizations, as well as specific issues relevant to the quality of the data provided.

In this report, Public Health Agency of Canada (PHAC)/Health Canada is shown as a distinct funding entity. Its investment represents monies that Health Canada and PHAC

provided to now defunct multi-funded initiatives (i.e., Canadian Breast Cancer Research Alliance and Canadian Tobacco Control Research Initiative) as well as monies administered by Canadian Institutes of Health Research (CIHR) for specific research programs. It does not include monies from its own non-research based funding programs. Although Health Canada funds the Canadian Partnership Against Cancer, the Partnership is shown as a separate organization in this report. A breakdown of the PHAC/Health Canada investment for 2012 is shown in Table 2.1.1.

Investment shown for the Networks of Centres of Excellence (NCE) refers to distinct cancer-relevant projects funded by three centres (i.e., Canadian Institute for Photonic Innovations (CIPI), Mathematics of Information Technology & Complex Systems (MITACS), and the Stem Cell Network (SCN)) as well as the investment in the Centres of Excellence for Commercialization and Research (CECR). Table 2.1.2 provides a summary of the CECR investment captured in this report for 2012.

Since 2009, social science or humanities research that is primarily intended to improve and/or increase knowledge of health, health care, and health-care systems is no longer eligible for support from Social Sciences and Humanities Research Council (SSHRC). The cancer research investment shown for SSHRC for the period 2008 to 2012 has dropped and may disappear over time.

TABLE 2.1.1

2012 CANCER RESEARCH INVESTMENT BY HEALTH CANADA AND THE PUBLIC HEALTH AGENCY OF CANADA (PHAC)

SECTOR/ORGANIZATION	PROGRAM	2012 Investment	
		\$	%
Multi-funded initiatives	Canadian Breast Cancer Research Alliance	1,104,656	6.6
	Canadian Tobacco Control Research Initiative	20,850	0.1
Federal agencies	Canadian Institutes of Health Research - Canada Breast Cancer Initiative	2,474,222	14.7
	Canadian Institutes of Health Research - Other programs	160,921	1.0
Canadian Partnership Against Cancer [1]	Canadian Partnership for Tomorrow Project (CPTP)	10,891,396	64.8
	Terry Fox Research Institute (TFRI) Translational Cancer Research Pilot Project	1,033,107	6.2
	The BETTER Project	1,110,578	6.6
TOTAL		16,795,730	100

[1] The Partnership is an independent organization funded by Health Canada. Amounts shown reflect only research-related investment.

TABLE 2.1.2

2012 CANCER RESEARCH INVESTMENT IN CENTRES OF EXCELLENCE FOR COMMERCIALIZATION AND RESEARCH (CECR)

CENTRE	Weighting	2012 Investment [1]			
		Canadian Institutes of Health Research	Natural Sciences and Engineering Research Council	Social Sciences and Humanities Research Council	TOTAL
Advanced Applied Physics Solutions, Inc. (AAPS), Vancouver	10	29,700	210,000	59,412	299,112
Centre for Commercialization of Regenerative Medicine - CCRM	10	210,000	60,000	30,000	300,000
Centre for Drug Research and Development (CDRD), Vancouver	33	588,192	251,790	147,086	987,068
Centre for Imaging Technology Commercialization - CImTeC	33	527,076	263,538	87,898	878,512
Centre for Probe Development and Commercialization (CPDC), Hamilton	100	1,690,000	1,004,000	297,115	2,991,115
Centre for Surgical Invention and Innovation - CSii	10	177,680	118,420	0	296,100
Institute for Research in Immunology and Cancer (IRIC)/CECR in Therapeutics Discovery (IRICoR), Montreal	100	1,937,600	567,200	486,315	2,991,115
MaRS Innovation - MI	33	327,030	333,300	326,738	987,068
The Prostate Centre's Translational Research Initiative for Accelerated Discovery and Development (PC-TRIADD), Vancouver	100	2,080,000	20,000	711,115	2,811,115
TOTAL		7,567,278	2,828,248	2,145,678	12,541,204

[1] Investment was prorated over a five-year timeframe and adjusted by the cancer relevance weighting. The investment shown in this table was used in this report and excludes other leveraged funding.

2.2 PROJECT CLASSIFICATION

All research projects were coded in terms of type of research and cancer site (see sidebar on next page). The Common Scientific Outline (CSO) was the typology used for coding the type of research, and final CSO coding for each project was determined after two coders independently classified the projects and then met to discuss discrepancies and determine final agreed-upon codes. Observed agreement of the blind-coded classifications of the two coders in terms of the seven CSO categories was 85.2%. The Cohen's kappa coefficient (unweighted) was 0.82 (95% confidence intervals 0.81-0.83), which is in the "almost perfect" agreement category according to Landis and Koch.²

Kite diagrams are used to illustrate the distribution of the CSO across its seven categories. A kite diagram is a type of area chart in which the y-axis is split into two equal parts ranging from 0 to 50%, with the 0 origin located in the middle of the graph. The kite diagram is a succinct visual for detecting differences/similarities across multiple organizations.

Cancer site classification was completed by one coder. In addition to the project descriptions, other sources of information, when available from participating organizations (e.g., site

2. J.R. Landis and G.G. Koch, "The measurement of observer agreement for categorical data," *Biometrics* 33, 1977:159-174.

checklists), were used to make the site determinations.

When a project was focused on a specific risk factor such as smoking and no mention was made of cancer sites in the project description/ additional information, predetermined site allocations based on expert input were used (e.g., for projects focused on smoking, the site allocations were lung 50%, esophagus 15%, larynx 15%, pharynx 15%, and all other sites 5%).

Projects were also grouped in terms of type of funding mechanism (see sidebar on next page for descriptions).

Within the appendices, key comparative analyses of data for investments in all five years are provided for participating organizations/programs (Appendix C), codes of the CSO (Appendix D), and cancer sites (Appendix E). These help to bridge the analyses presented in this report with previously published reports by providing updated investment figures. As with our previous reports, the data presented herein is subject to change based on future data submissions or refinements.

2.3 REPORTING CONVENTIONS

The term “cancer research investment” represents the direct funding of cancer research that received some form of peer review and that was administered by organizations participating in the survey. (There is also, however, an estimate of the cancer-relevant portion of the federal government’s Indirect Costs Program in Table 3.4.1). Within the context of this report, “peer review” is defined as the process of subjecting a research proposal to the scrutiny of others who are experts in the same or similar fields. These experts conduct an impartial review (i.e., they do not have any competing professional or personal interests). The formats for peer review vary among organizations and funding mechanisms, and range from formalized reviews to more ad hoc arrangements to the use of in-house expertise as is commonly used for related support grants.

All projects conducted within calendar years 2008 to 2012 are included. Given that many organizations have different grant cycles and fiscal years, the selection of calendar year is intended to standardize data collection. Unless additional data was provided by the funding organization, annual investment was calculated on a prorated basis and assumes that the project dollars were paid out in equal monthly instalments based on project start and end dates. Investment figures are not adjusted for inflation.

In this report, sector breakdowns have been used to denote the sectors of the organizations that funded the research projects. This means that the investment for projects funded by two

PROJECT CLASSIFICATION

All projects within the CCRA database were classified according to type of research and type of cancer. The classification was determined on the basis of the available project summary. The Common Scientific Outline (CSO), a classification system specific to cancer research, was used as the tool to classify research type. The CSO is the principal classification framework used by the International Cancer Research Partnership (ICRP). The 38 CSO codes are organized into seven broad categories of scientific interest. Each project within the CCRA database was assigned a relevant CSO code. Where more than one CSO code was assigned to a given project, the project budget was distributed equally among the codes. For more information about the CSO, please refer to <https://www.icrpartnership.org/CSO.cfm>.

Projects were also classified according to cancer site using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, (ICD-10), 2015-WHO Version. The ICD-10 is an international standard diagnostic classification used for general studies of the distribution and frequency of human disease and for health management purposes. It is also used in the national reporting of new cancer cases. Similar to the CSO coding, some projects were assigned more than one cancer site. In these cases, the project budget was allocated accordingly to each code so that it summed to 100% of the total. An electronic version of the ICD-10 is available from the World Health Organization. Please refer to <http://apps.who.int/classifications/icd10/browse/2015/en/> for more information.

or more organizations will be reflected in the investment amounts of the organizations that provided the funding. For example, the investments in Canada Foundation for Innovation (CFI) projects are shown under CFI (40%) within the federal government sector, under the provincial government sector (40%), and under “Other” (20%).³ Sector allocations for Genome Canada for 2012 are summarized in Table 2.3.1. For “Alberta Cancer,” the estimations are summarized in Table 2.3.2.

The institutional affiliation of the nominated PI or project leader was used for analyses based on geography (province). There is only one nominated PI per project. Components of multi-component projects are considered individual projects if the funding organization provided details (i.e., description, researchers, budget, etc.) on the component parts. The CCS, NRC, Ontario Institute for Cancer Research (OICR), and The Terry Fox Foundation provided this level of detail. For clinical trials supported by the CCS (i.e., NCIC Clinical Trials Group), each site involved in the trial was treated as a separate project with its own PI and budget (based on per case and site administration funding).

Project budgets have been weighted in terms of the extent to which they were focused on cancer. Budgets for projects determined to have the study of cancer as their primary focus were weighted at 100%. This included all projects funded by organizations that fund only cancer research, as well as research funded by other organizations where the research was focused on cancer. Budgets for all other research projects that were not entirely focused on cancer were weighted on the basis of the available

DEFINITIONS OF FUNDING MECHANISMS

Operating grants: competitive grants that support all the direct costs involved in conducting specific research projects performed by identified researchers. Operating grants typically cover salaries for laboratory staff and research assistants/associates/trainees, costs of research equipment and supplies, and other specific research-related expenses. Multi-component projects (program projects), feasibility grants, proof-of-principle grants, regional development grants, innovation grants, and knowledge translation grants are all included in this category.

Equipment/infrastructure grants: competitive grants that cover, in part or in full, the costs of construction or major remodelling of new research facilities, and/or the purchase, housing, and installation of equipment, scientific collections, computer software, information databases, and communication linkages used primarily for conducting research. It includes funding for costs associated with cohort establishment.

Career awards: competitive awards that provide protected time for research on either a long- or short-term basis to outstanding researchers who have demonstrated high levels of productivity and research accomplishments. These awards are given to only a small percentage of all researchers. (They may also be called salary awards.) Research chairs are also included under this funding mechanism.

Trainee awards: competitive awards that recognize outstanding trainees and support them during their undergraduate, graduate, or post-graduate training. Trainees from Canada who are studying at institutions outside Canada may also be eligible for some types of trainee awards. Block training grants given to institutions that in turn distribute the monies to trainees through a competitive process are also included under this funding mechanism. These awards are in addition to trainee salaries covered in operating grants.

Related support grants: competitive grants that support travel, workshops/symposia, and researcher time for proposal development/letters of intent. These grants involve small sums of money.

3. CFI does not provide the details of the partner investment. In the database, the estimated partner contributions were calculated on the basis of the CFI maximum contribution.

project descriptions (see Table 2.3.3 for some examples of how weightings were applied). Weightings (i.e., the percentage of funding of a particular project that was assessed as being focused on cancer research) ranged from 5% to 100% (see Table 2.3.4). Of note, six of the CFI “Research Hospital Fund – Large Scale Institutional Endeavours” were included in investments shown in this report, with weightings ranging from 10% to 33%.⁴

All projects are coded to cancer sites using the ICD-10 in accordance with the level of detail provided in the project description. ICD-10 codes are rolled up to 24 cancer sites. Collectively, these cancer sites represent ~90% of all new cancer cases and deaths per year.

In this report, when the term “number of projects” is specified, it refers to a count of projects without the weightings applied. When the term “project equivalents” is used, it refers to a count of projects with the weightings applied.

TABLE 2.3.1

2012 CANCER RESEARCH INVESTMENT BY FUNDING SOURCE FOR GENOME CANADA PROGRAMS

SECTOR	FUNDING SOURCE	2012 Investment	
		\$	%
Federal government	Genome Canada	9,192,381	44.5
	Canadian Institutes of Health Research	7,062,894	34.2
Provincial government		1,668,829	8.1
Charities		327,722	1.6
Other	Industry	1,248,183	6.0
	Foreign	658,491	3.2
	Not Specified	519,807	2.5
TOTAL		20,678,305	100

4. Includes: Newfoundland and Labrador Centre for Interdisciplinary Research in Human Genetics (cancer weighting 10%; 2012 weighted amount \$678,000); Building the UHN Advanced Therapeutics Research Platform (cancer weighting 20%; 2012 weighted amount \$9,225,597); Translational Research and Intervention Across the Lifespan (cancer weighting 20%; 2012 weighted amount \$9,998,834); Centre for Image-Guided Therapeutics (cancer weighting 25%; 2012 weighted amount \$8,000,000); The SickKids Child Health Research Institute (cancer weighting 33%; 2012 weighted amount \$15,034,664); Translation of Innovation into Medical Excellence (TIME_x) (cancer weighting 20%; 2012 weighted amount \$2,459,023).

TABLE 2.3.2

SECTOR INVESTMENT ESTIMATES FOR ALBERTA CANCER [1], 2008 TO 2012

YEAR	In This Report		TOTAL Alberta Cancer [1]
	Provincial Government Organizations – Alberta Innovates – Health Solutions	Voluntary Organizations – Alberta Cancer Foundation	
2008	10,142,110	11,298,929	21,441,040
2009	9,005,517	11,082,045	20,087,562
2010	7,331,361	11,659,905	18,991,266
2011	6,992,322	10,971,234	18,926,056
2012	3,038,776	10,876,891	14,876,166

[1] Alberta Cancer represents an amalgamation of different funding sources, including Alberta Cancer Board, Alberta Cancer Foundation, Alberta Health Services, and the Alberta Cancer Prevention Legacy Fund administered by Alberta Innovates – Health Solutions. For the sake of simplicity, these were grouped under provincial government organizations in previous reports. These estimates are provisional. Upon verification, these may change in future reports.

TABLE 2.3.3

EXAMPLES OF THE APPLICATION OF CANCER WEIGHTINGS TO RESEARCH PROJECTS

ISSUE	EXAMPLE	APPROACH
Project is not entirely focused on cancer	<i>Quality of end-of-life care: The perspectives of bereaved family members of lung cancer and COPD patients, health care providers and policy makers in rural and urban areas</i>	Budget was weighted at 50% as the research was looking at cancer and chronic obstructive pulmonary disease (COPD).
Project spans more than one category of the CSO	<i>Functional genomic classification and selected therapies of breast cancer using genome-wide pooled lentiviral shRNA library screens</i>	Budget was allocated to CSO codes 2.2 - Endogenous factors in the origin and cause of cancer and 5.3 - Systemic therapies - discovery and development.
Project involves more than one cancer site	<i>Molecular Characterization of Circulating Tumour Cells in Breast and Prostate Cancer</i>	Budget was allocated 50-50 to two cancer sites (i.e., breast and prostate).

TABLE 2.3.4

DISTRIBUTION OF WEIGHTINGS APPLIED TO CCRS PROJECTS, 2008-2012

Cancer weight (%)	Projects	
	Number	%
100	9,819	81
80	105	Less than 1
75	13	Less than 1
67	6	Less than 1
50	530	4
40	4	Less than 1
33	1,055	9
25	93	Less than 1
20	382	3
17	2	Less than 1
10	138	1
TOTAL	12,147	100

3. 2012 INVESTMENT AND TRENDS IN INVESTMENT, 2008–2012

This chapter describes the 2012 investment as well as changes in amount and distribution of the cancer research investment from 2008 to 2012. We examine the investment by funding sector, areas of research, cancer sites, and funding mechanism.

3.1 FUNDING SECTOR

Overall, cancer research investment rose from \$487.3M in 2008 to \$561.7M in 2009, fluctuating up and down slightly for years 2010 to 2012 (Figure 3.1.1). In contrast, the five-year period 2005–2009 profiled in our last trend report showed a year-upon-year increase in investment. From 2008 to 2012, the number of projects peaked in 2009. Weighted number of nominated PIs, however, was highest in 2011, while the highest number of trainees was in 2010.

Research investment for the federal and provincial government sectors showed the same fluctuating pattern as the overall investment (Figure 3.1.2). The voluntary sector, however, showed year-upon-year growth, with \$22.2M more being invested in cancer research in 2012 than in 2008.

Programs/agencies funded by the federal government represented 47% of the \$561.7M total 2012 cancer research investment. This does not include an estimated \$23.3M in cancer-attributable indirect costs based on information provided by the federal government's Indirect Costs Program (see Table 3.4.1).

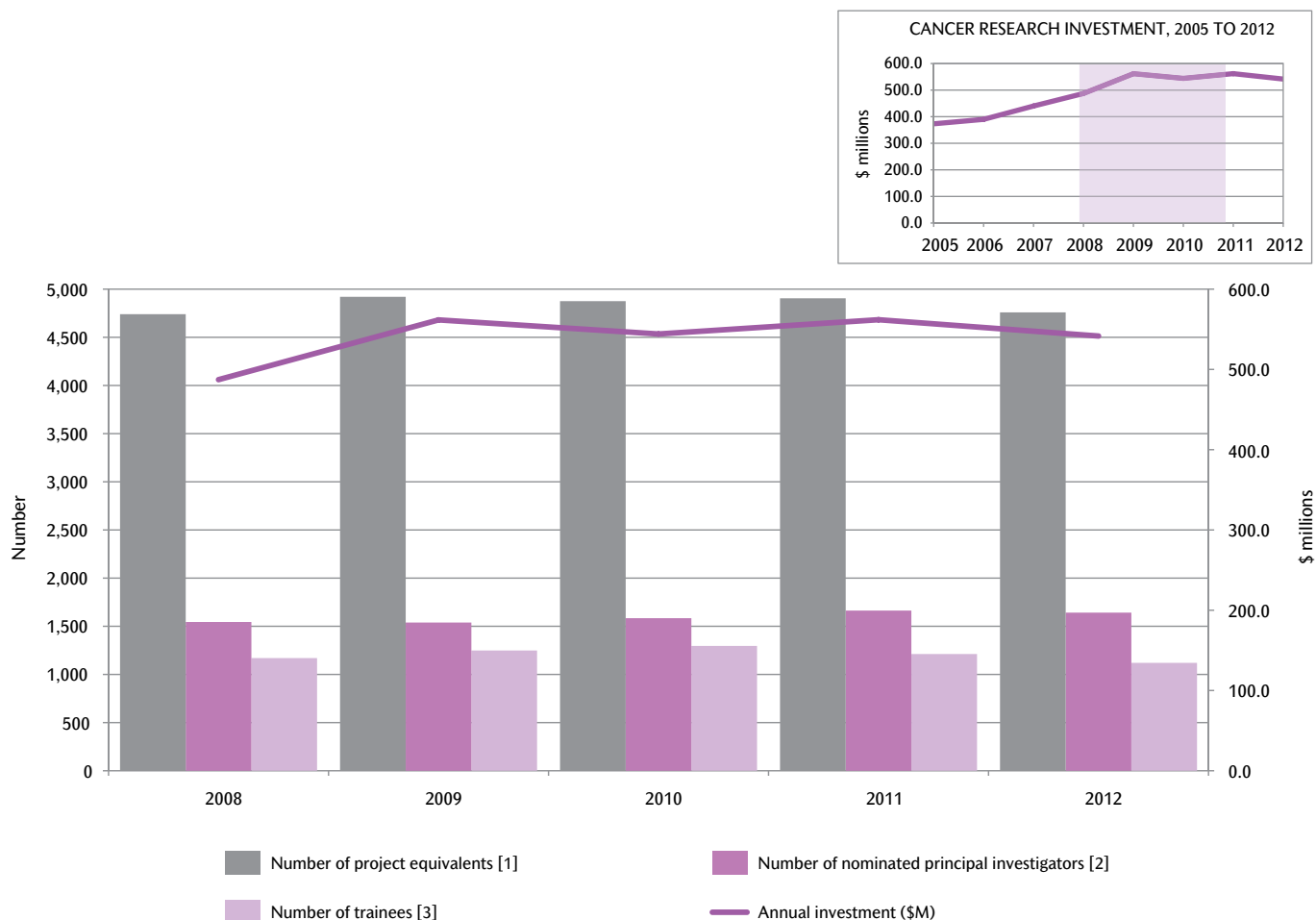
CIHR was the single largest investor in cancer research, representing 27% of the total investment in 2012 (Figure 3.1.3). The OICR represented 41% of the \$131.6M provincial government investment and 11% of the \$561.7M total. The continued ramp up of investment by OICR and the Ontario Ministry of Research and Innovation (OMRI) is captured in the time period covered in this report. Investment by the CCS represented 30% of the total voluntary sector investment and 7% of the overall investment. For 11 of the 18 organizations captured in the voluntary sector, the growth in investment from 2008 to 2012 surpassed the overall growth of 11%.

Research investment on a per capita basis for years 2008 and 2012 by province of nominated PI is summarized in Figure 3.1.4. Per capita investment was highest in Ontario for both years and showed positive upward growth of 19%. For B.C., the percent change increase from 2008 to 2012 was 3%. In all other provinces, the 2008 investment was higher than in 2012. The investment from only provincial sources is also presented in this figure. Three provinces (Ontario, Newfoundland and Labrador, and Manitoba) had higher per capita provincial investments in 2012 than in 2008.

TREND SUMMARY

- The 2008 to 2012 period was characterized by only limited growth in cancer research investment (adjusting for inflation, the percent increase was 4%).
- The federal government continued to be the chief funder of cancer research, with CIHR as the leading funding agency.
- Strategic investment by the government of Ontario was substantial during the 2008 to 2012 period. Combined, OICR and OMRI went from representing 7% of the overall cancer research investment in 2008 to 14% in 2012, with \$38.9M more invested in 2012 than 2008.
- Unlike the relatively flat five-year investment trends for the federal and provincial governments, the investment by the voluntary sector showed a year-upon-year increase. Combined, organizations within this sector invested \$22.2M more in 2012 than in 2008, largely driven by new dollars from the Canadian Breast Cancer Foundation (CBCF), Prostate Cancer Canada, and The Terry Fox Foundation.

FIGURE 3.1.1
CANCER RESEARCH INVESTMENT, 2008 TO 2012



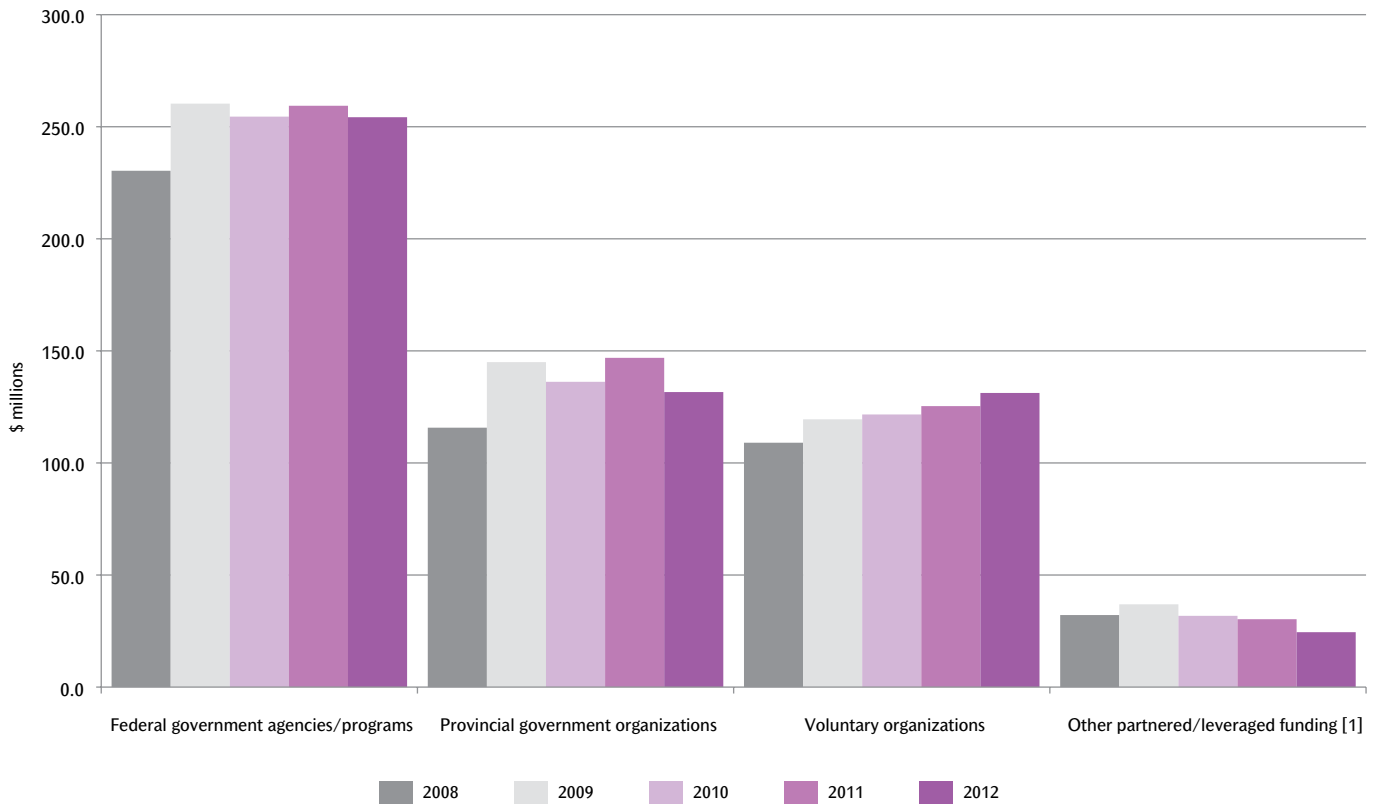
	2008	2009	2010	2011	2012
Number of project equivalents [1]	4,740.0	4,920.3	4,875.2	4,904.9	4,758.7
Number of nominated principal investigators [2]	1,542.6	1,537.1	1,581.1	1,657.9	1,633.6
Number of trainees [3]	1,169.7	1,248.5	1,295.7	1,211.9	1,120.2
Annual investment (\$ millions)	487.3	561.7	544.1	561.9	541.6

[1] Number of projects funded at some point in the calendar year and weighted by cancer relevance (i.e., projects may be weighted from 10% to 100% in terms of their cancer relevance).

[2] Number of nominated investigators for operating grants, career awards, and equipment/infrastructure awards that were funded at some point in the calendar year. Number was weighted by the average cancer relevance of the investigators' projects.

[3] Number of trainees who received training awards for undergraduate, graduate, and postgraduate studies. Number was weighted by the average cancer relevance of the trainees' projects.

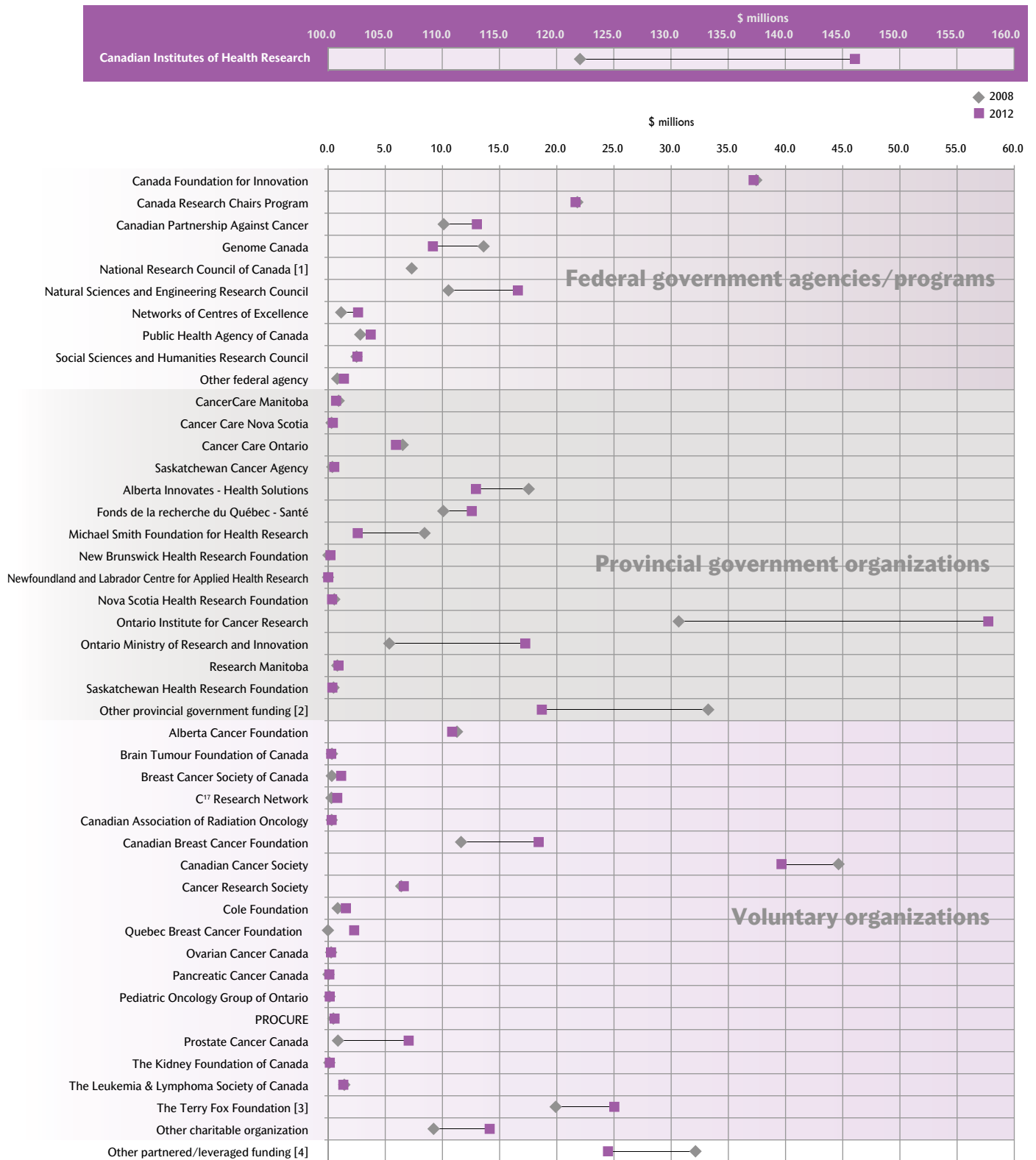
FIGURE 3.1.2
CANCER RESEARCH INVESTMENT BY FUNDING SECTOR, 2008 TO 2012



[1] Co-funded projects supported by CCRS participating organizations by institutional, industry, and foreign sources.

FIGURE 3.1.3

CANCER RESEARCH INVESTMENT BY PARTICIPATING ORGANIZATIONS/PROGRAMS, 2008 AND 2012



[1] NRC did not report new data for 2012.

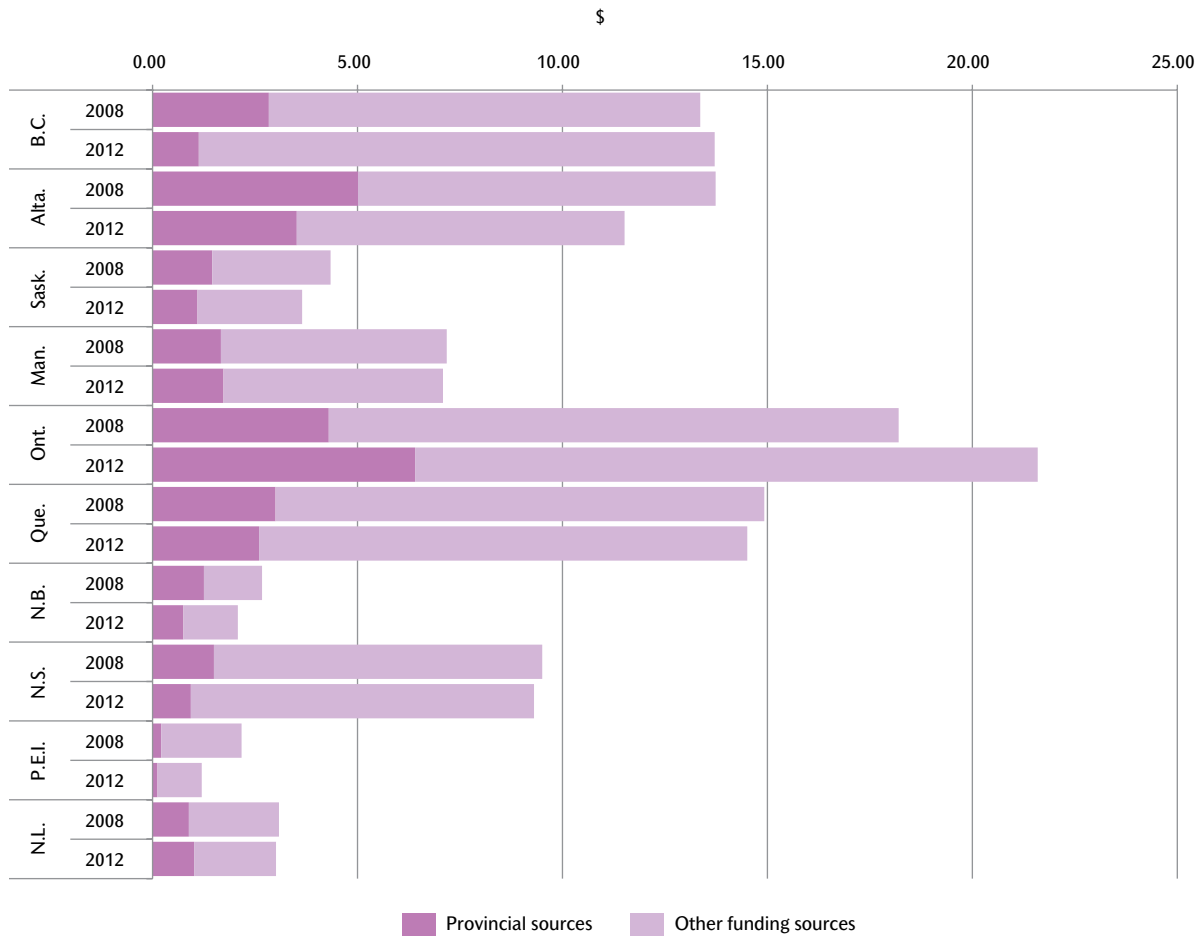
[2] Provincial funding for CFI projects for all provinces is included under 'Other provincial government funding.'

[3] Investment includes projects supported by The Terry Fox Research Institute.

[4] Co-funding of projects supported by CCRS participating organizations by institutional, industry, and foreign sources.

FIGURE 3.1.4

PER CAPITA CANCER RESEARCH INVESTMENT BY PROVINCE OF NOMINATED PI, 2008 AND 2012 [1]



	B.C.	Alta.	Sask.	Man.	Ont.	Que.	N.B.	N.S.	P.E.I.	N.L.
2008 cancer research investment (\$ millions)	58.1	49.4	4.4	8.6	234.5	115.8	2.0	8.9	0.3	1.6
2012 cancer research investment (\$ millions)	62.3	44.8	4.0	8.9	289.6	117.3	1.6	8.8	0.2	1.6
2008 per capita investment (\$) - all sources [2]	13.36	13.74	4.34	7.18	18.20	14.92	2.67	9.51	2.17	3.08
2012 per capita investment (\$) - all sources [2]	13.71	11.52	3.65	7.09	21.59	14.51	2.08	9.31	1.20	3.01
Percent change in per capita investment from 2008 to 2012	3	-16	-16	-1	19	-3	-22	-2	-45	-2
2008 investment from provincial sources (% of total investment)	21	36	34	23	24	20	47	16	10	29
2012 investment from provincial sources (% of total investment)	8	31	30	24	30	18	36	10	10	34

[1] Excludes trainee awardees studying outside of Canada and a single grant to a PI located in the territories.

[2] Provincial population figures based on July 1 estimates from Statistics Canada, CANSIM, table 051-0001 (accessed 02-Feb-2015) were used in the per capita investment calculation.

3.2 TYPES OF RESEARCH

Figure 3.2.1A shows the trend in the investment by CSO for the five years. Biology research, which had the largest share of the investment until 2011, peaked in 2009, and has since been surpassed by the investment in Treatment research. Investments in all other areas were higher in 2012 than in 2008, but showed only modest growth. A number of funders from all sectors invested less in Biology in 2008. The conclusion of four major projects funded under the Genome Canada Competition III – Health Disciplines in 2010 and a steady decline in CFI-funded equipment/infrastructure in the cancer biology area over the five-years, however, exerted the largest influence on the declining investment in Biology.

The investment in treatment research accounted for 29% (\$154.9M) of the overall investment in 2012, topping all other categories within the CSO. The increased investment in Treatment research was largely influenced by five funders: CIHR, Genome Canada, OICR, OMRI, and NSERC. Combined, their investment in 2012 was \$28.8M more than in 2008. For CIHR and Genome Canada, this increased investment was due in large part to the investment in projects funded under the Cancer Stem Cell Consortium. For OICR, the increase was the result of new investments made in medicinal chemistry and regional biotherapeutics platforms and programs. Under the Research Excellence Program, OMIR commenced funding of four large treatment-focused projects in 2010. The increase for NSERC was largely attributable to projects funded under the Collaborative Health Research Projects and Strategic Network Grants programs.

A kite diagram for the total investment comparing 2008 and 2012 is provided in Figure 3.2.1B. Individual kite diagrams are also presented for each of the 42 organizations/programs in Figure 3.2.2. As a general caveat, for organizations with total annual investments of less than \$2M, the distributions can be markedly changed by a few projects.

A detailed breakdown of the investment by the 38 CSO codes is provided in Table 3.2.1. (For a comparison of the five years of data, please refer to Appendix D.) Although the investment in Biology fell over time, it is noteworthy the investment in research within code 1.4 (Cancer Progression and Metastasis) increased from \$27.9M to \$34.6M from 2008 to 2012. Code 5.3 (Systemic Therapies – Discovery and Development) represented 17% of the overall investment in 2012 and increased by \$24.4M from 2008. Code 2.4 (Resources and Infrastructure for Etiological Research) increased three-fold from 2008, due largely to investments in genomics platforms and technologies supporting the International Cancer Genome Consortium.

Figure 3.2.3 shows kite diagrams of the CSO distribution for the 2008 and 2012 investments by province of nominated PI. A sizeable drop (23% or \$20.3M less in 2008 than 2012) in the research investment in Biology was found among the research led by Ontario PIs and was affected by changes in the Genome Canada and CFI funding as previously explained. Changes in the CSO distribution specifically for operating grants are detailed in Section 3.4.

TREND SUMMARY

- The investment in treatment research accounted for 29% of the overall investment in 2012, topping all other categories within the CSO. Much of this growth was in the area of discovery/development of systemic therapies. It is plausible that some of the growth in treatment research reflects the rising interest among funders and researchers in moving discovery/biology research along the translational pipeline.
- Unlike other areas of the CSO, the investment in Biology was lower in 2012 than in 2008. The reduced investment was largely due to the conclusion of large-scale projects funded by Genome Canada and a shift in equipment/infrastructure projects funded through CFI.
- Although investment in Biology was at its lowest in 2012, investment in research focused on cancer progression and metastasis steadily climbed from 2008 to 2012, accounting for 6% of the overall cancer research investment in 2012.

FIGURE 3.2.1A
CANCER RESEARCH INVESTMENT BY CSO CATEGORY, 2008 TO 2012

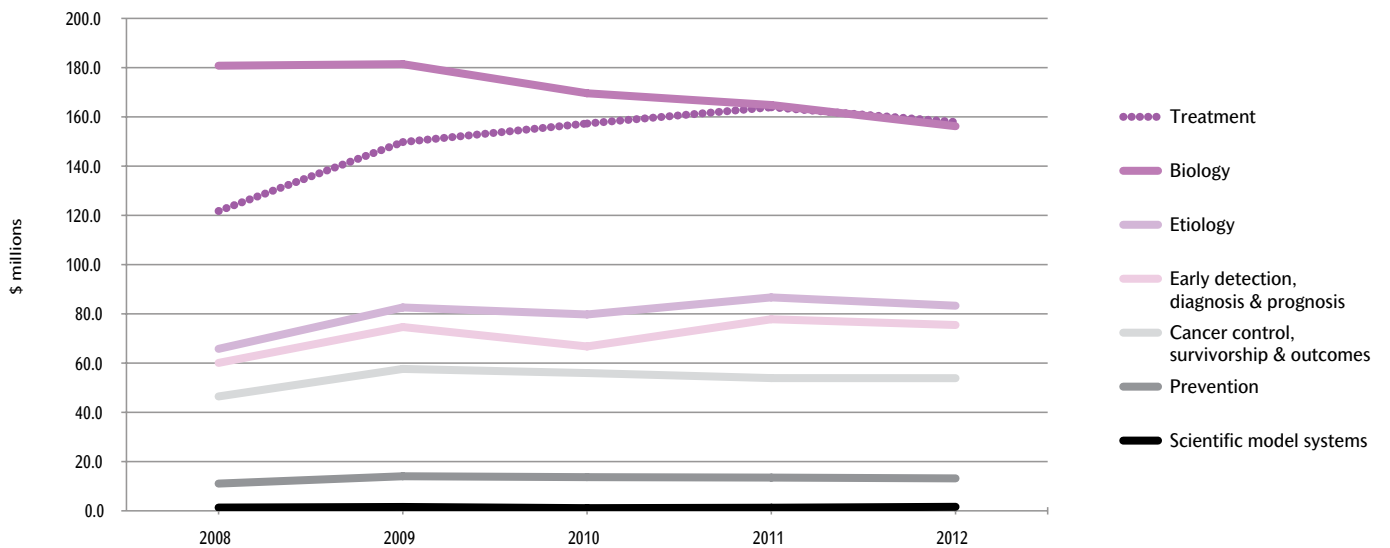
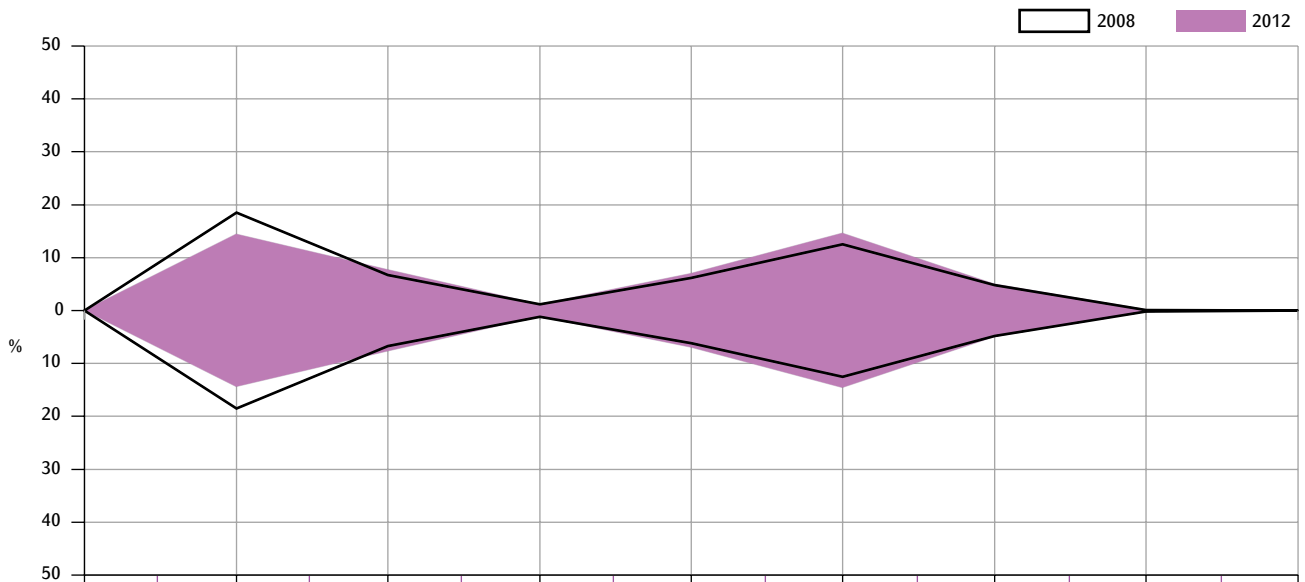


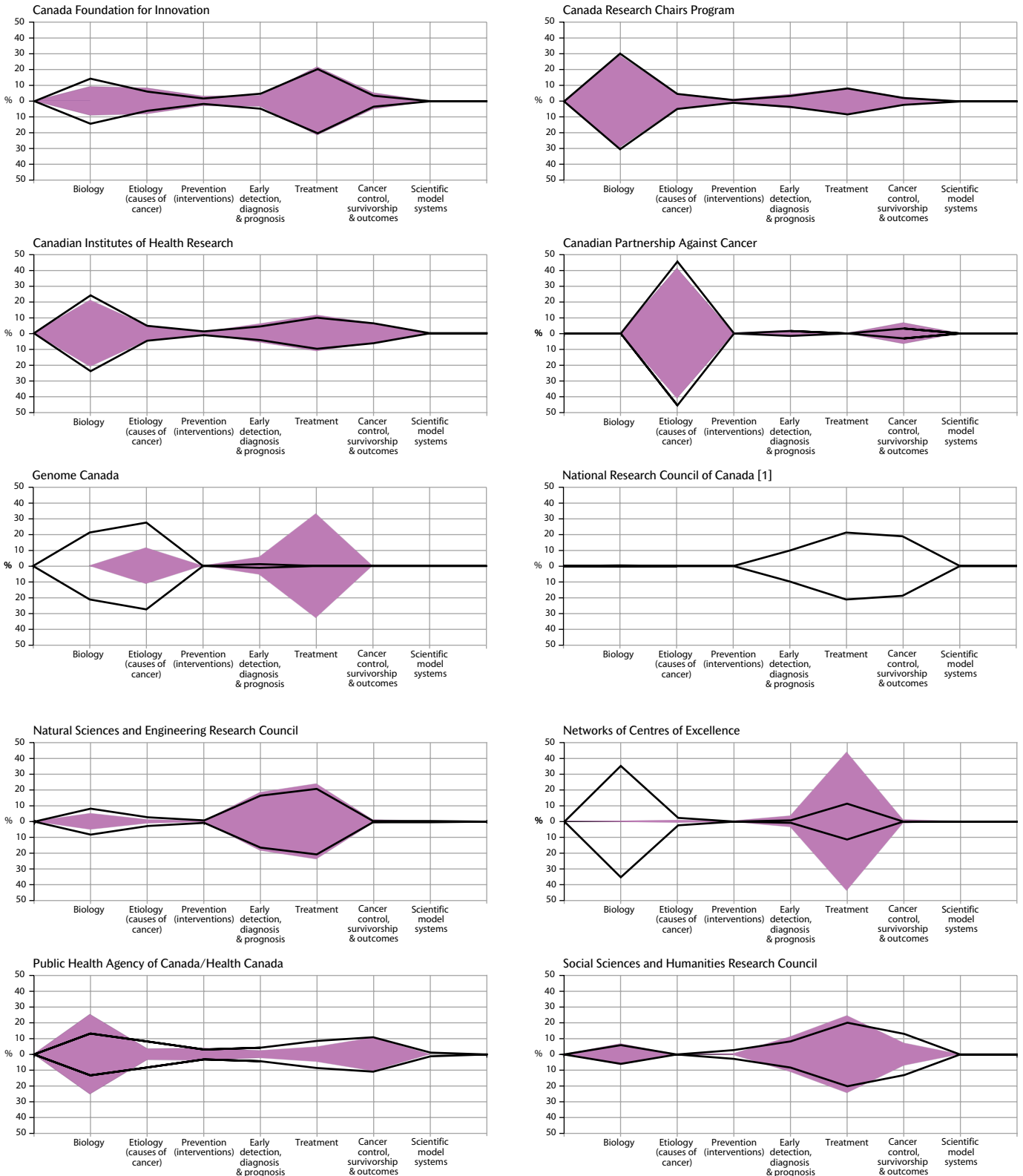
FIGURE 3.2.1B
DISTRIBUTION OF CANCER RESEARCH INVESTMENT BY CSO CATEGORY, 2008 AND 2012



		Biology	Etiology (causes of cancer)	Prevention (interventions)	Early detection, diagnosis & prognosis	Treatment	Cancer control, survivorship & ourcomes	Scientific model systems
Investment (%)	2008	37.1	13.5	2.3	12.3	25.0	9.5	0.3
	2012	28.8	15.4	2.4	13.9	29.2	10.0	0.3
Investment (\$ millions)	2008	180.8	65.8	11.1	60.1	121.8	46.5	1.3
	2012	156.2	83.3	13.2	75.5	157.9	53.9	1.6
Percent change from 2008 to 2012 investment		-14	27	19	26	30	16	23

FIGURE 3.2.2
DISTRIBUTION OF CANCER RESEARCH INVESTMENT BY CSO CATEGORY FOR PARTICIPATING ORGANIZATIONS, 2008 AND 2012

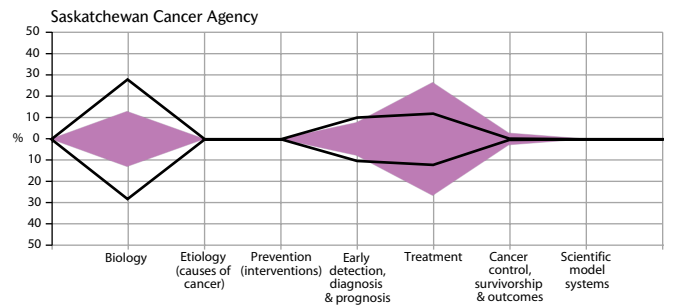
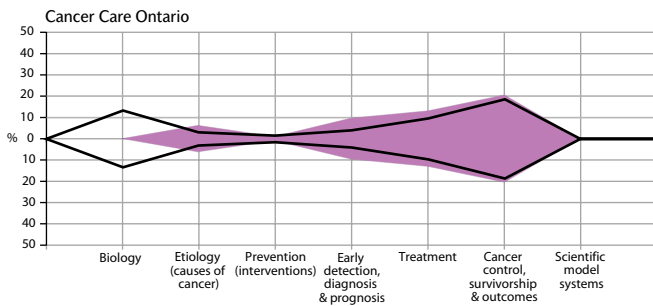
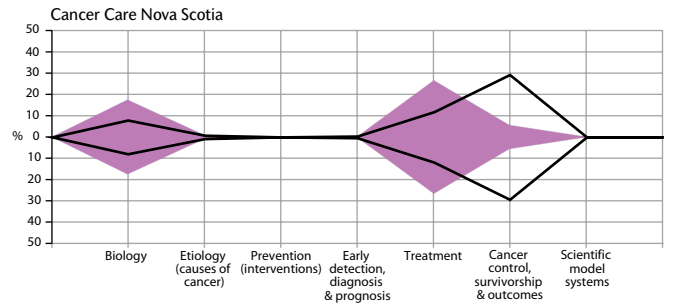
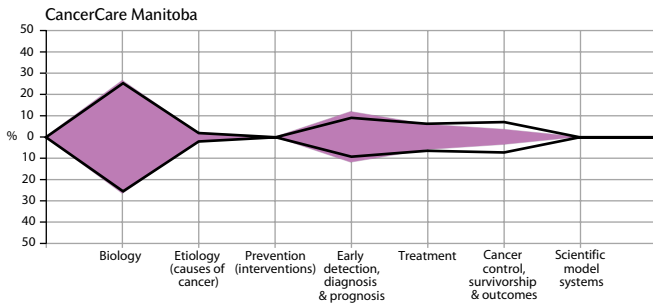
FEDERAL GOVERNMENT AGENCIES/PROGRAMS



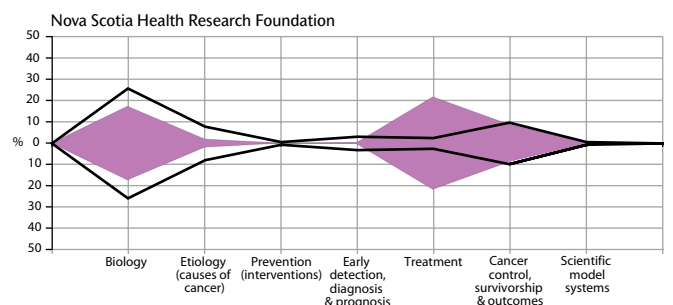
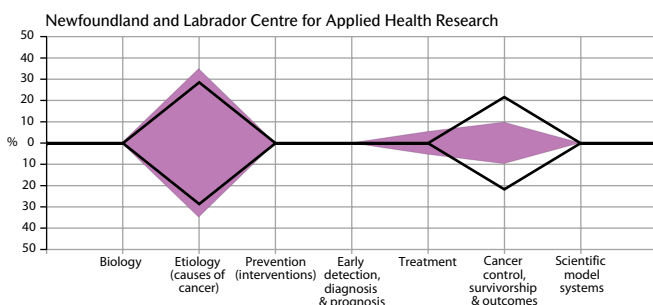
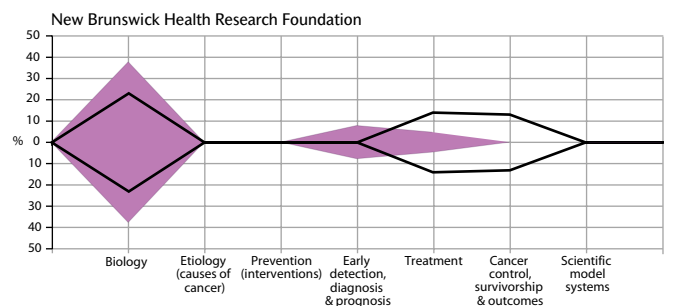
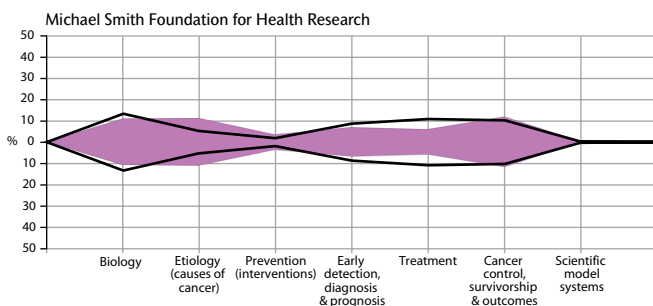
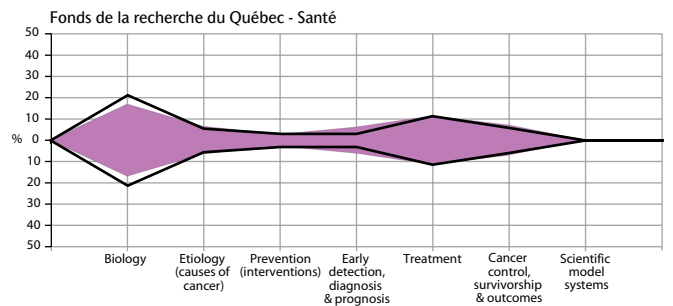
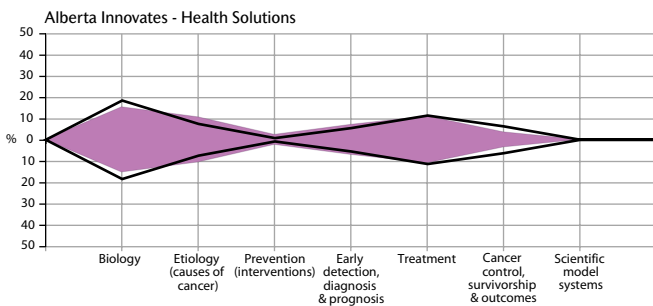
[1] NRC did not report new data for 2012.

2008 2012

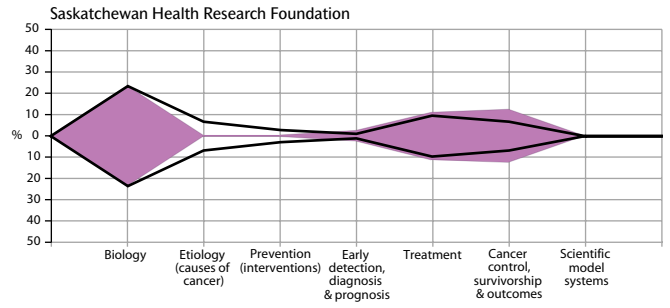
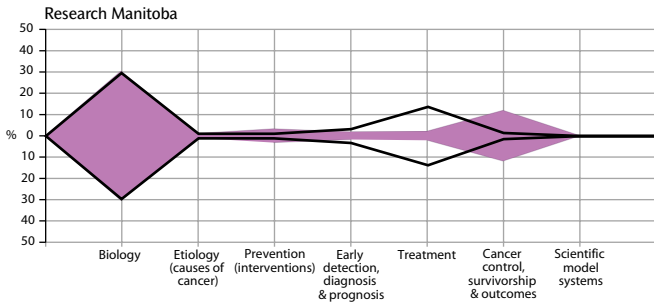
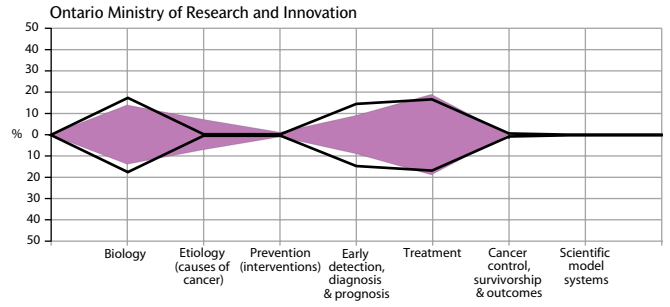
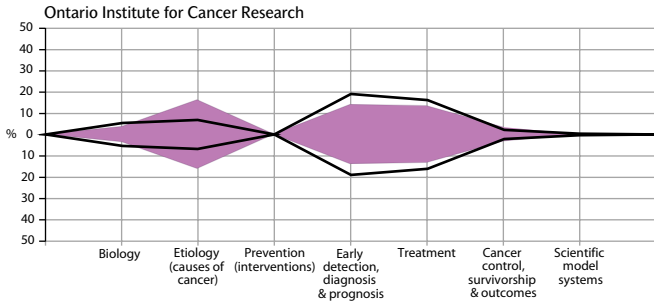
PROVINCIAL CANCER AGENCIES



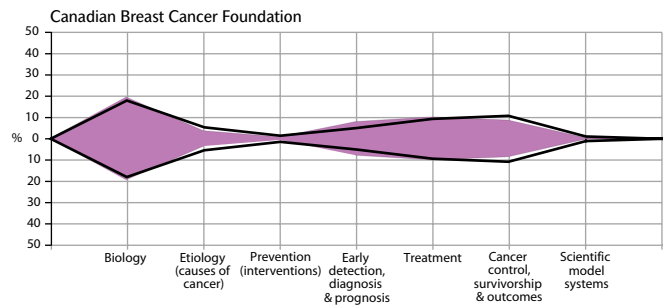
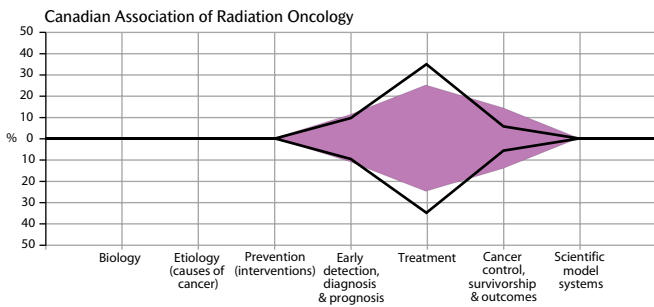
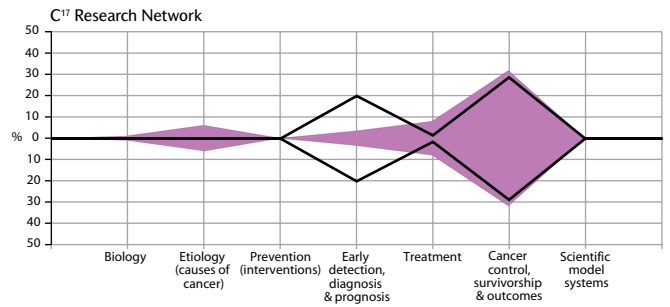
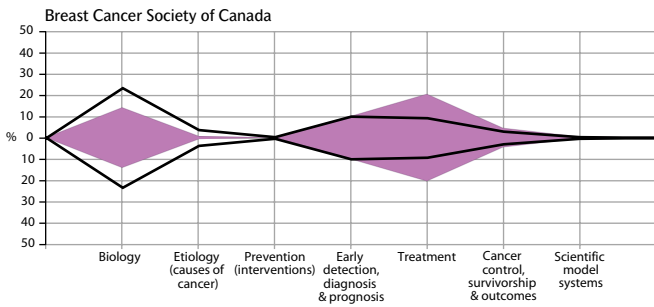
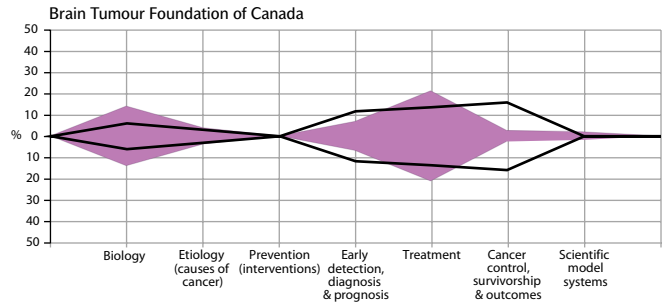
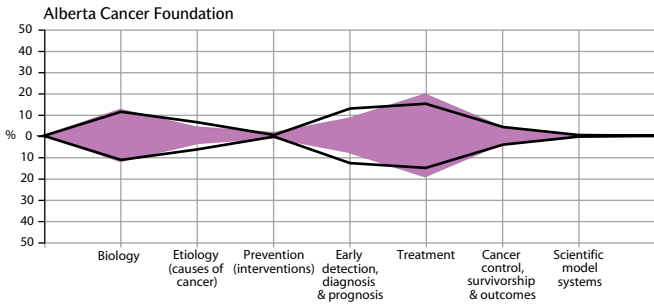
PROVINCIAL HEALTH RESEARCH ORGANIZATIONS



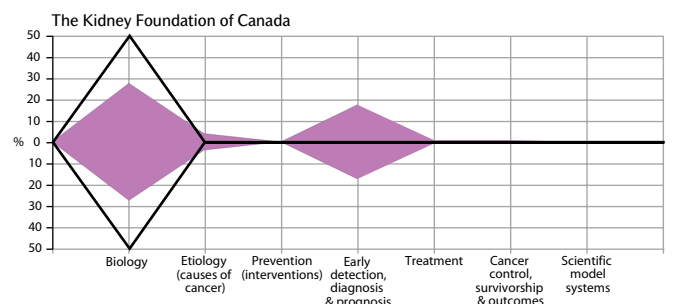
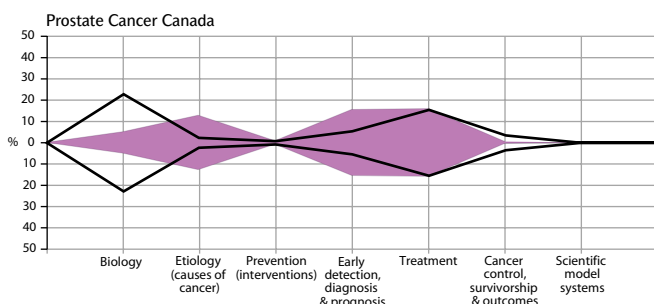
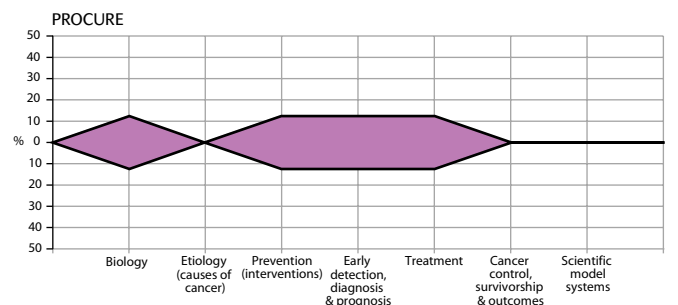
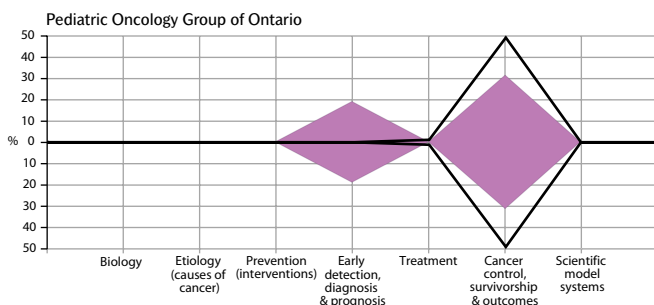
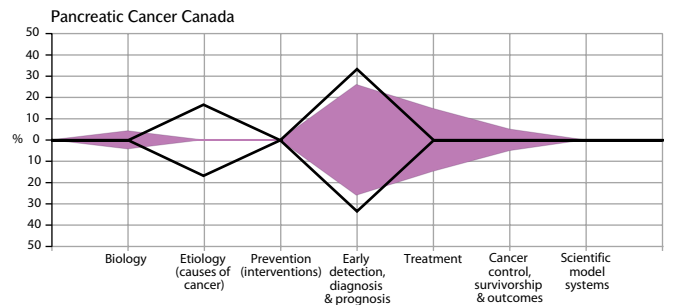
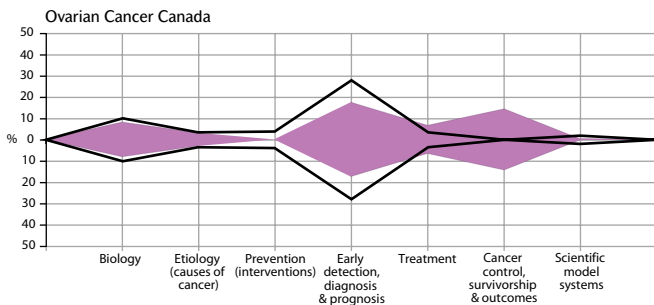
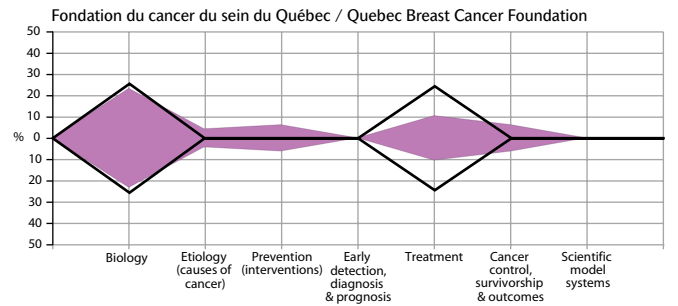
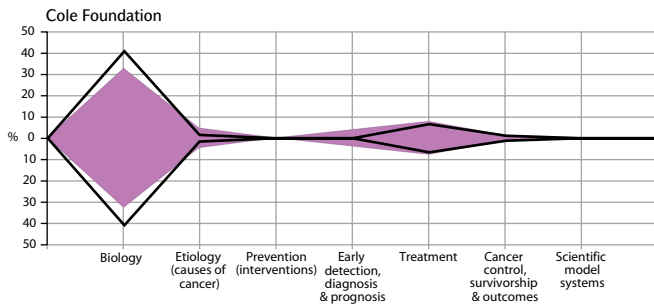
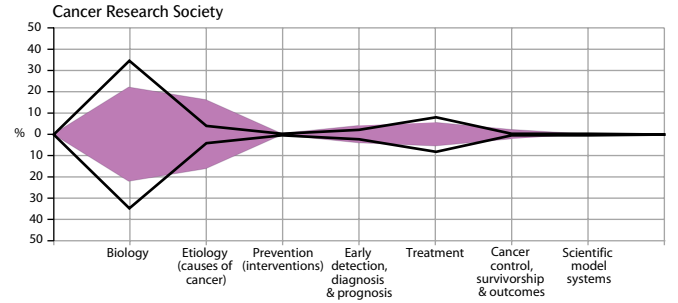
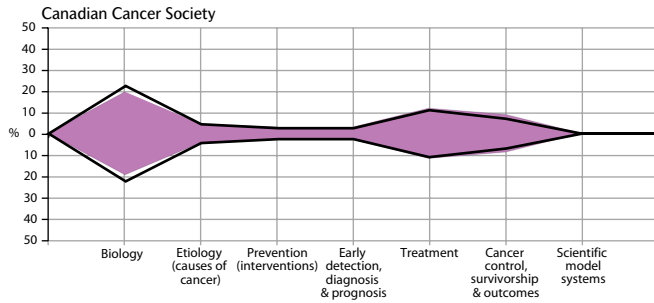
2008 2012



VOLUNTARY ORGANIZATIONS

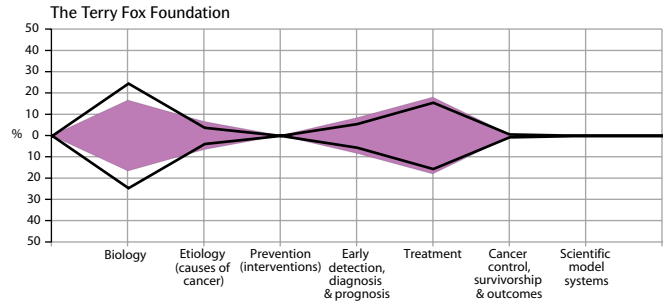
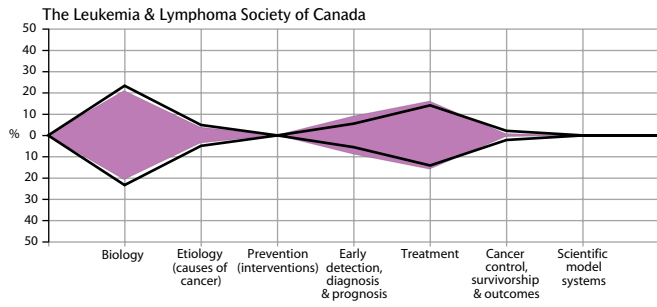


2008 2012



2008

2012



2008 2012

TABLE 3.2.1

DISTRIBUTION OF 2012 CANCER RESEARCH INVESTMENT BY CSO CODES

CSO Category	CSO Code [1]	2012 Investment (\$)	% Total Investment	% Category Investment
1 - BIOLOGY \$156,213,693 28.8%	1.1 - Normal functioning	56,179,119	10.4	36.0
	1.2 - Cancer initiation: alterations in chromosomes	13,130,896	2.4	8.4
	1.3 - Cancer initiation: oncogenes and tumour suppressor genes	36,319,429	6.7	23.2
	1.4 - Cancer progression and metastasis	34,561,471	6.4	22.1
	1.5 - Resources and infrastructure	16,022,779	3.0	10.3
2 - ETIOLOGY \$83,305,914 15.4%	2.1 - Exogenous factors [2] in the origin and cause of cancer	25,285,376	4.7	30.4
	2.2 - Endogenous factors [3] in the origin and cause of cancer	28,696,400	5.3	34.4
	2.3 - Interactions of genes and/or genetic polymorphisms [4] with exogenous and/or endogenous factors	8,870,647	1.6	10.6
	2.4 - Resources and infrastructure	20,453,490	3.8	24.6
3 - PREVENTION \$13,176,858 2.4%	3.1 - Interventions to prevent cancer: personal behaviours that affect cancer risk	3,234,703	0.6	24.5
	3.2 - Nutritional science in cancer prevention	1,701,801	0.3	12.9
	3.3 - Chemoprevention	2,269,722	0.4	17.2
	3.4 - Vaccines	573,180	0.1	4.3
	3.5 - Complementary and alternative prevention approaches	276,522	0.1	2.1
	3.6 - Resources and infrastructure	5,120,920	0.9	38.9
4 - EARLY DETECTION, DIAGNOSIS & PROGNOSIS \$75,471,964 13.9%	4.1 - Technology development and/or marker discovery	31,459,131	5.8	41.7
	4.2 - Technology and/or marker evaluation with respect to fundamental parameters of method	11,520,998	2.1	15.3
	4.3 - Technology and/or marker testing in a clinical setting	8,452,856	1.6	11.2
	4.4 - Resources and infrastructure	24,038,979	4.4	31.9
5 - TREATMENT \$157,915,100 29.2%	5.1 - Localized therapies [5] – discovery and development	18,005,345	3.3	11.4
	5.2 - Localized therapies – clinical applications	4,204,282	0.8	2.7
	5.3 - Systemic therapies [6] – discovery and development	89,681,439	16.6	56.8
	5.4 - Systemic therapies – clinical applications	8,130,354	1.5	5.1
	5.5 - Combinations of localized and systemic therapies	2,192,046	0.4	1.4
	5.6 - Complementary and alternative treatment approaches	510,736	0.1	0.3
	5.7 - Resources and infrastructure	35,190,899	6.5	22.3
6 - CANCER CONTROL, SURVIVORSHIP & OUTCOMES \$53,874,042 9.9%	6.1 - Patient care and survivorship issues	15,067,241	2.8	28.0
	6.2 - Surveillance	3,173,581	0.6	5.9
	6.3 - Behaviour	6,414,953	1.2	11.9
	6.4 - Cost analyses and health care delivery	11,307,799	2.1	21.0
	6.5 - Education and communication	1,961,143	0.4	3.6
	6.6 - End-of-life care	3,262,406	0.6	6.1
	6.7 - Ethics and confidentiality in cancer research	255,836	0.0	0.5
	6.8 - Complementary and alternative approaches for supportive care of patients and survivors	202,405	0.0	0.4
	6.9 - Resources and infrastructure	12,228,676	2.3	22.7
7 - SCIENTIFIC MODEL SYSTEMS \$1,692,615 0.3%	7.1 - Development and characterization of model systems [7]	1,507,631	0.3	92.3
	7.2 - Application of model systems	0	0.0	0.0
	7.3 - Resources and infrastructure	124,986	0.0	7.7
TOTAL		541,590,186	100	

[1] For a full description of the CSO codes, please refer to <https://www.icrpartnership.org/CSO.cfm>.

[2] Exogenous (originating outside) factors: Lifestyle and environmental factors, and infectious agents like viruses and bacteria that are involved in the origins and causes of cancer.

[3] Endogenous (originating within) factors: Internal factors such as free radicals and genetic factors that are involved in the origins and causes of cancer.

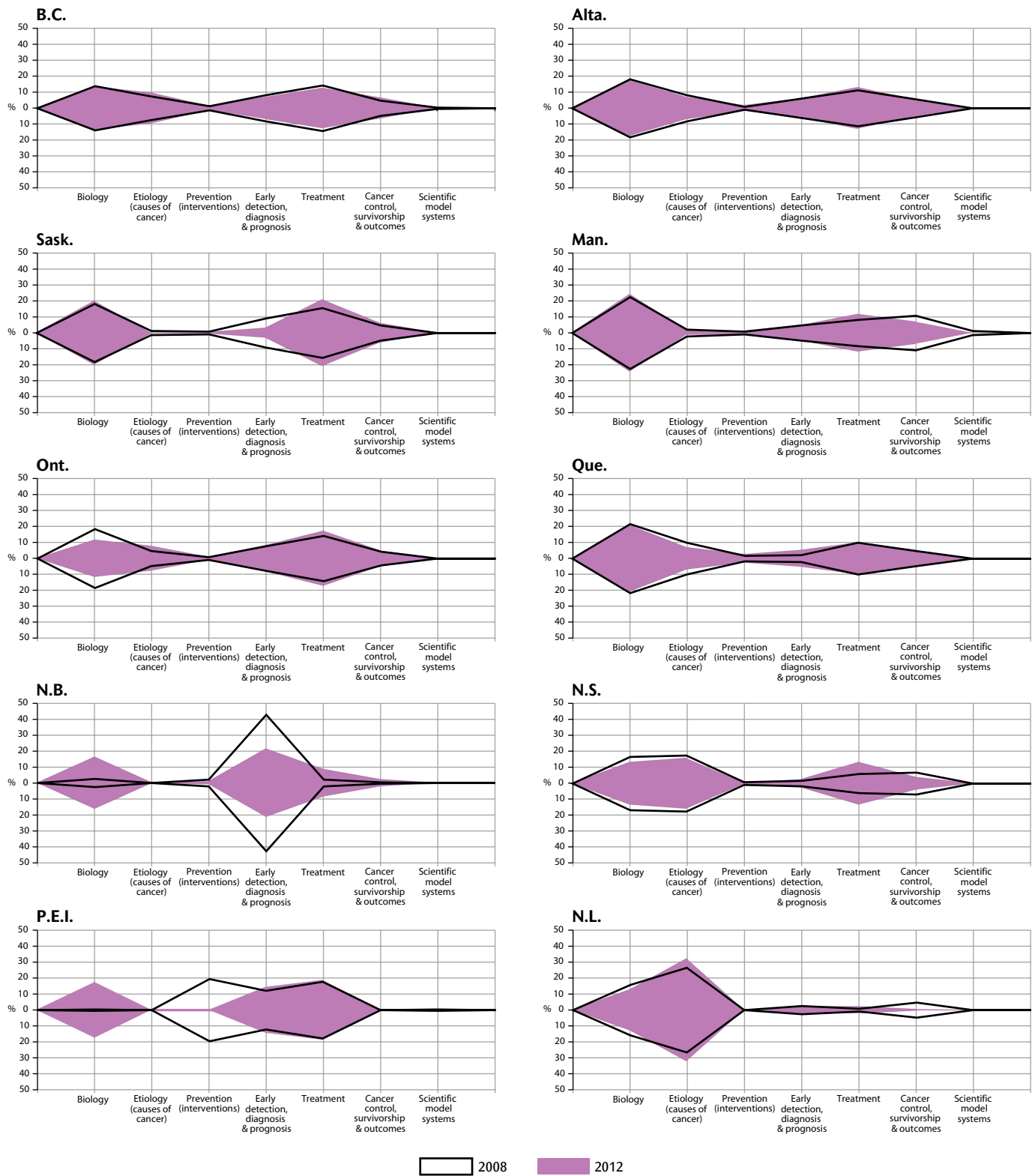
[4] Polymorphisms: Mutations or common variations in a person's DNA.

[5] Localized treatments: Treatments that are administered locally (such as radiotherapy and surgery).

[6] Systemic treatments: Treatments that are administered throughout the body (such as drugs).

[7] Model systems: Specially developed animals, cell cultures, and computer simulations that are used to study cancer processes.

FIGURE 3.2.3
DISTRIBUTION OF CANCER RESEARCH INVESTMENT BY CSO CATEGORY FOR PROVINCE OF NOMINATED PI, 2008 AND 2012



		B.C.	Alta.	Sask.	Man.	Ont.	Que.	N.B.	N.S.	P.E.I.	N.L.
Project equivalents	2008	629.0	598.4	66.9	170.5	1,774.4	1,207.5	12.9	131.9	6.0	24.3
	2012	570.0	514.0	79.8	154.9	1,931.8	1,212.5	33.4	140.4	4.0	24.6

3.3 CANCER SITES

In 2012, 53% of the investment was attributable to site-specific cancers and this represents a 21% increase over 2008. A comparison of the 2008 and 2012 investments by cancer site is provided in Figure 3.3.1. In terms of the site-specific investment, breast cancer (\$75.9M), prostate cancer (\$37.9M), and leukemia (\$32.5M) had the greatest share of the investment. Investment increased more than the overall 21% for pancreatic cancer (590%), ovarian cancer (87%), prostate cancer (41%), and kidney cancer (28%). The large percentage increase in investment of pancreatic cancer research was solely due to the pancreatic genome project initiated in 2009 by OICR. The investment in lung and colorectal cancer research was also higher in 2012 than in 2008, with percentage changes at 17% and 12%, respectively. Data for all five years is provided in Appendix E.

Figure 3.3.2 shows the proportion of 2012 site-specific cancer research investment relative to the distribution of new cases and cancer deaths. For many cancers, most notably, lung and colorectal cancers, the research investment was not commensurate with the burden of disease. Lung cancer is the leading cause of new cancer cases and cancer deaths in Canada.

Kite diagrams based on the 2008 and 2012 investments are presented in Figure 3.3.3 for the nine cancers with the highest combined proportions of new cases and deaths. The distribution for breast cancer changed very little. There were sizeable upward shifts in the proportion of the investment in Treatment for leukemias and colorectal cancer, Etiology for pancreatic and prostate cancers, and Early Detection, Diagnosis & Prognosis for bladder and kidney cancers as well as for Non-Hodgkin lymphoma. There was also a proportional increase from 2008 to 2012 in the Biology investment for Non-Hodgkin lymphoma and less so, for lung cancer, in contrast to the other cancer sites.

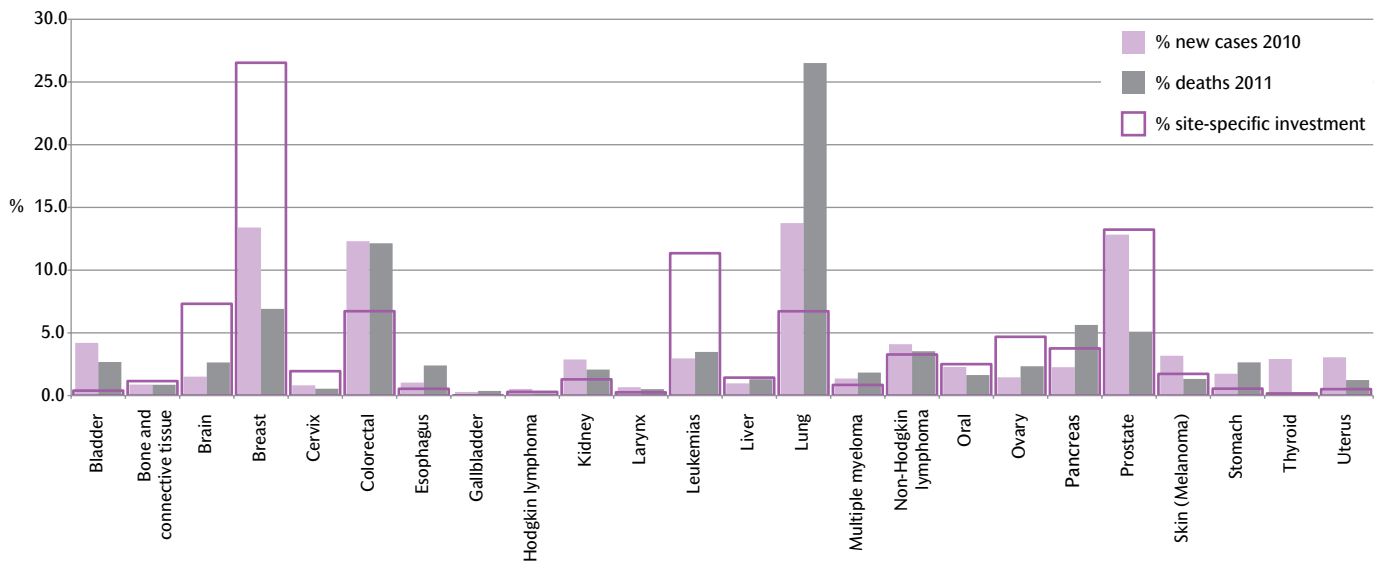
TREND SUMMARY

- Site-specific research in Canada continued to be dominated by breast cancer research.
- Leukemia research also had a high level of investment, reflecting Canada's historic and ongoing strength in the area of hematopoiesis and stem cell research.
- Research investments in lung and colorectal cancers, while up from 2008, were not commensurate with the burden of these cancers as measured by new cases and deaths.

FIGURE 3.3.1
CANCER RESEARCH INVESTMENT BY CANCER SITES, 2008 AND 2012



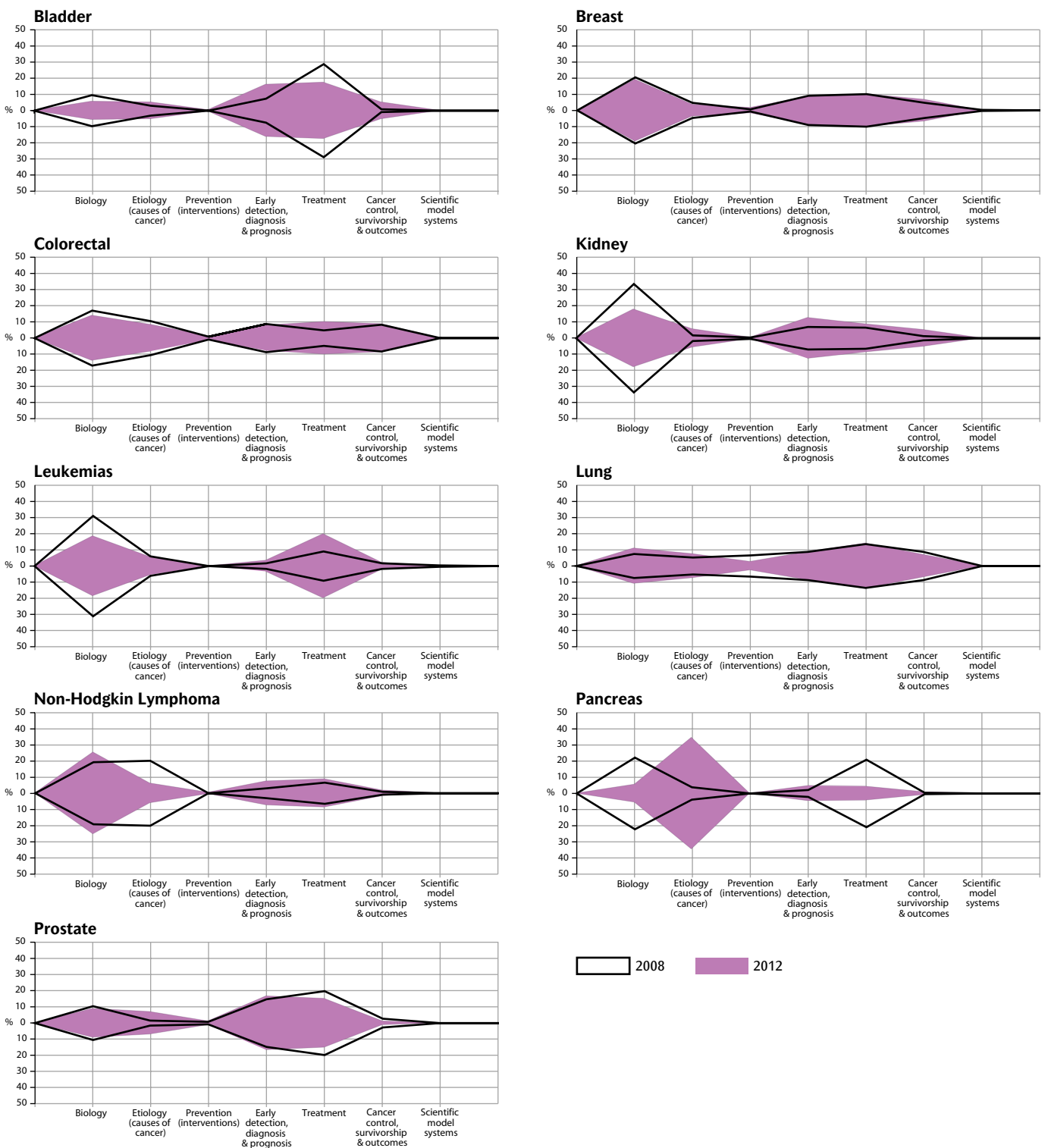
FIGURE 3.3.2
DISTRIBUTION OF 2012 SITE-SPECIFIC CANCER RESEARCH INVESTMENT (\$286.2M) BY NEW CANCER CASES IN 2010 [1] AND CANCER DEATHS IN 2011 [2]



[1] Source for new cancer cases: *CCS Canadian Cancer Statistics 2014* (from 2010 CANSIM Table 103-0553 for September 2012 CCR file and Quebec 2010).
 [2] Source for cancer deaths: CANSIM Table 102-0522 Deaths, by cause, Chapter II: Neoplasms, Canada, annual (number) - 2011 (accessed June 3, 2014)

FIGURE 3.3.3

DISTRIBUTION OF CANCER RESEARCH INVESTMENT BY CSO CATEGORY FOR SELECTED CANCER SITES [1], 2008 AND 2012



[1] Represents cancers with the highest combines proportions of new cases and deaths.

Investment (\$ millions)		Bladder	Breast	Colorectal	Kidney	Leukemia	Lung	Non-Hodgkin's lymphoma	Pancreas	Prostate
		2008	1.3	66.5	17.3	2.9	27.1	16.5	11.6	1.6
	2012	1.1	75.9	19.3	3.7	32.5	19.2	9.4	10.8	37.9
Percentage change from 2008 to 2012		-1.0	14	12	28	20	17	-20	590	41

3.4 FUNDING MECHANISMS

This section describes the cancer research investment in terms of funding mechanisms. Over half (55%) of the 2012 investment was in operating grants (Figure 3.4.1). Twenty-seven percent of the 2012 investment is accounted for by operating grants supported by the federal government. Table 3.4.1 further elaborates the entire federal government investment for 2012 and includes an estimate of indirect costs based on the federal Indirect Costs Program (\$23.3M).

Distribution of the 2008 and 2012 investment by CSO for each funding mechanism is shown in Figure 3.4.2. The investment in Biology dropped from 2008 to 2012 for all funding mechanisms. Treatment was proportionately higher in 2012 for operating grants and an upward shift in Etiology was found for equipment/infrastructure grants. The dramatic shift in the investment distribution for related support is due to small investment figures.

The 2012 investment for each province by funding mechanism is detailed in Table 3.4.2. Equipment/infrastructure grants represented a sizeable proportion of the investment going to PIs in Ontario. Career awards continued to be a big component (17%) of the investment going to PIs in Alberta and trainee awards were a large part (12%) of the investment in Nova Scotia.

A more detailed look at operating grants is presented in Figure 3.4.3. Among regional/provincial funding sources, the investment in operating grants was 62% higher in 2012 than in 2008 (the percent change increase for national operating grants was 14%). Nearly all of the increased investment was due to funding programs that were focused on specific research areas and, to a lesser extent, funding programs focused on specific cancer sites.

Figure 3.4.4 shows the change in investment by selected funders for the four types of operating grants. CIHR remained the largest funder of operating grants. Nationally available open operating grants provided by CIHR showed a slight increase (11%) and by CCS, a decrease (15%) between 2008 and 2012. There were a number of funding organizations with nationally available operating grants focused on a specific cancer site and/or research area. CIHR and TFF dominated this group and both had higher investments in 2012 than in 2008. No single group accounted for a large portion of the regionally offered open grants competitions. Combined, however, the Alberta-based funders (i.e., Alberta Cancer Foundation and AIHS) accounted for 31% of the investment in this group of operating grants in 2012. The investment in focused operating grants by regional funders was dominated by three organizations: OICR, CBCF, and OMRI. Combined these three organizations invested \$22.7M more in 2012 than in 2008.

A comparison of the CSO distributions for 2008 and 2012 is presented for national and regional funding programs by all four focus groups in Figure 3.4.5. The CSO distribution for the nationally available open operating grants did not change whereas for the regionally available open operating grants, there was a proportional shift from Biology and Early Detection, Diagnosis & Prognosis to Treatment research. National funding programs focused on specific areas of research shifted towards Treatment from Biology; research-focused regional funding had a proportional increase in Etiology and decrease in Treatment in 2012 compared to 2008. Site-specific funding with no restrictions on area of research showed decreases in the proportion

of investment in Etiology and very slight increases in the proportion of investment in Biology. The investment from national funders for funding programs focused on both cancer sites and research areas showed the greatest shift in the distribution, with proportionately less going to Biology, Prevention, and Cancer Control, Survivorship & Outcomes and proportionately more going to Early Detection, Diagnosis & Prognosis and Etiology. The distribution of the investments from regional funders for funding programs focused on both cancer sites and research areas, which represents the smallest investment, changed only nominally from 2008 to 2012, with proportionately less going to Prevention, and Cancer Control, Survivorship & Outcomes and proportionately more going to Early Detection, Diagnosis & Prognosis.

TREND SUMMARY

- Operating grants increased year-upon-year to an all-time high of \$299.7M in 2012.
- CIHR and CCS accounted for the largest portions of the investment in operating grants and were the only two organizations offering nationally available open (non-focused) operating grant competitions.
- The distribution of the less restrictive funding programs (i.e., nationally available open operating grants) changed very little from 2008 to 2012 and over half of the investments were in Biology.
- Regionally funded operating grants transformed the investment landscape with increased overall investment, particularly in focused programs in the areas of Treatment and Early Detection, Diagnosis & Prognosis

FIGURE 3.4.1

2012 CANCER RESEARCH INVESTMENT BY FUNDING MECHANISM FOR FUNDING SECTORS (\$541.6M)

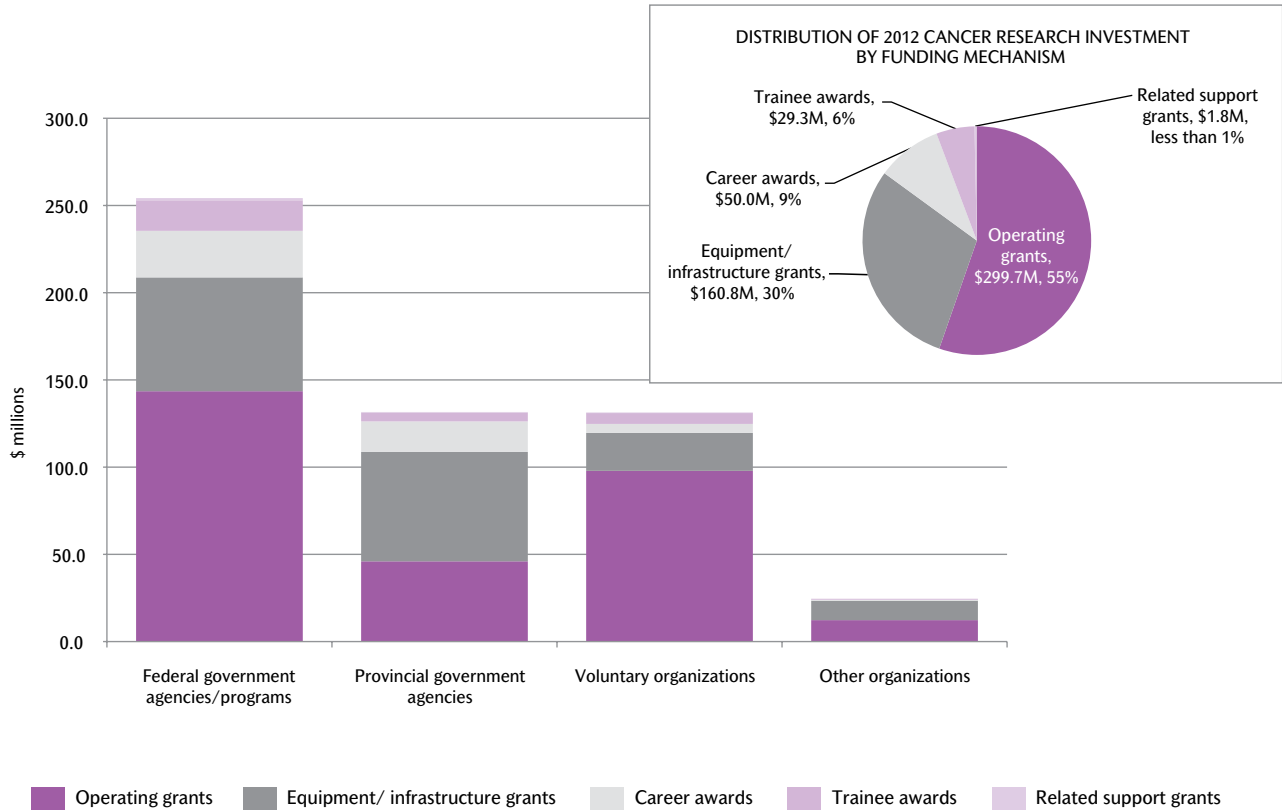


TABLE 3.4.1

2012 FEDERAL GOVERNMENT CANCER RESEARCH INVESTMENT BY FUNDING MECHANISM

PROGRAM/ ORGANIZATION	FUNDING MECHANISM						TOTAL
	Operating grants	Equipment/ infrastructure grants	Institutional support (indirect costs)	Career awards	Trainee awards [1]	Related support grants	
Atlantic Canada Opportunities Agency*	–	273,339	–	–	–	–	273,339
Canada Excellence Research Chairs Program*	–	–	–	471,429	–	–	471,429
Canada Foundation for Innovation	–	37,218,927	–	–	–	–	37,218,927
Canada Research Chairs Program	–	–	–	21,658,130	–	–	21,658,130
Canadian Institutes of Health Research	116,498,903	9,749,551	–	4,467,050	14,246,693	1,125,344	146,087,540
Canadian Partnership Against Cancer [2]	2,143,685	10,891,396	–	–	–	–	13,035,081
Canadian Space Agency*	50,000	–	–	–	–	–	50,000
Genome Canada	8,098,941	1,093,439	–	–	–	–	9,192,381
Indirect Costs Program	–	–	23,271,294	–	–	–	23,271,294
National Research Council of Canada [3]	–	–	–	–	–	–	–
Natural Sciences and Engineering Research Council	10,183,425	3,785,437	–	0	2,637,763	13,398	16,620,023
Networks of Centres of Excellence [4]	2,131,250	–	–	–	422,250	100,485	2,653,985
Public Health Agency of Canada/ Health Canada [5]	3,609,232	21,715	–	98,050	0	31,653	3,760,649
Social Sciences and Humanities Research Council	187,020	2,211,678	–	–	200,000	0	2,598,698
Western Economic Diversification Canada*	625,000	–	–	–	–	–	625,000
TOTAL	143,527,456	65,245,482	23,271,294	26,694,658	17,506,705	1,270,880	277,516,474

This table includes an estimate of the cancer component of the Indirect Costs Program. Cells with a hyphen indicate that there were no funding mechanisms of that type offered by the program/organization. This is distinguished from \$0 values, which indicate that funding programs within that mechanism were offered by the organization, but there were no cancer relevant projects funded in 2012.

* denotes organizations that are included in other analyses under the 'Other federal agency' category.

[1] Includes Canada Graduate Scholarships totalling \$7,839,081 (CIHR \$6,505,318; NSERC \$1,205,429; SSHRC \$128,333).

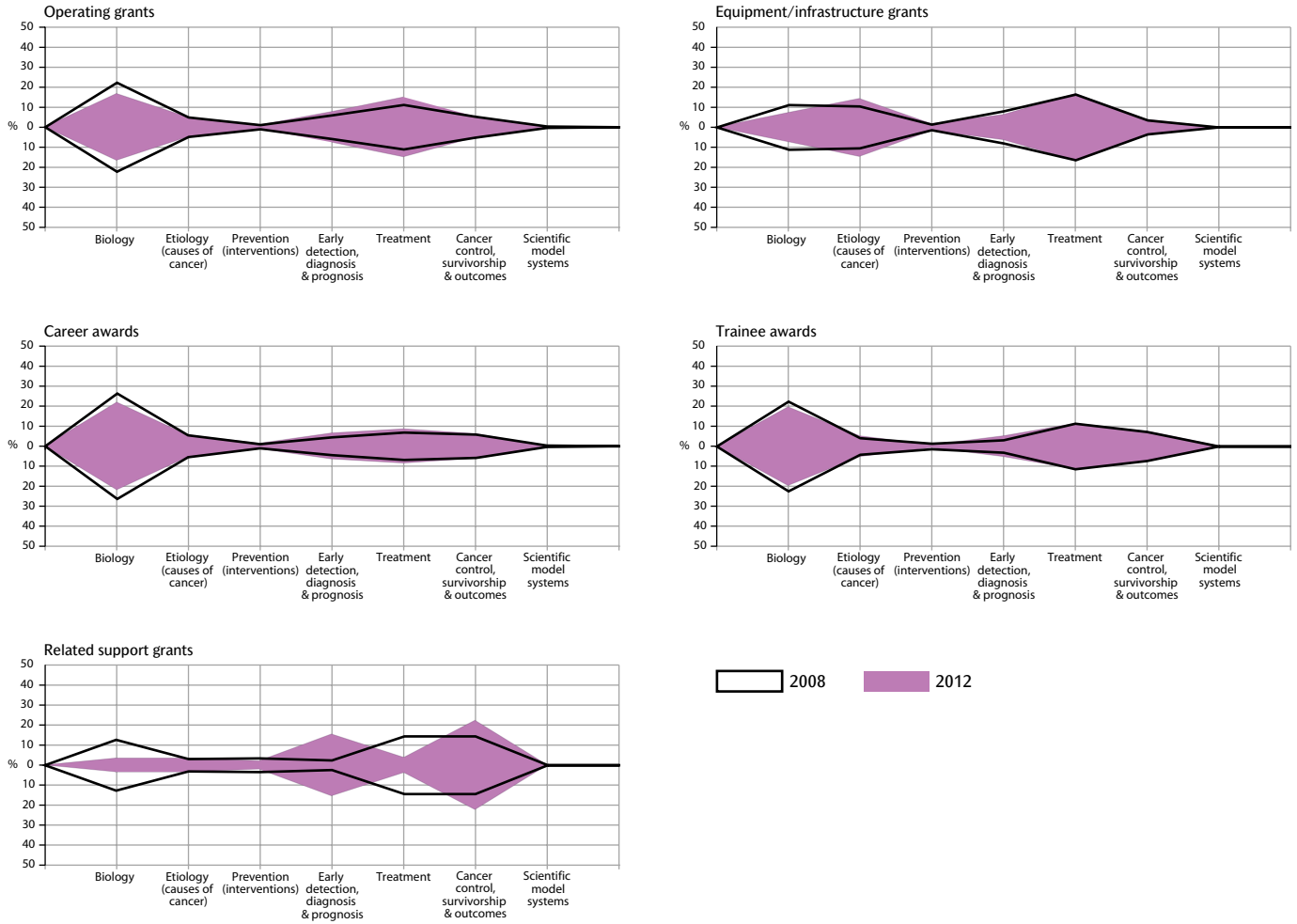
[2] Includes \$10,891,396 for the Canadian Partnership for Tomorrow Project (equipment/infrastructure), \$1,110,578 for The BETTER Project, and \$1,033,107 for the Terry Fox Research Institute Translational Cancer Research Project program. The Partnership is an independent organization funded by Health Canada.

[3] Because NRC is the process of redesigning internal protocols, data on cancer-related projects for 2012 were unavailable and could not be provided for this report.

[4] Does not include federal contributions to the management and related activities of the networks. Investment in the CECRs is reflected under the federal funding agencies as follows: CIHR \$7,567,278; NSERC \$2,828,248; and SSHRC \$2,145,678 (total for 2012 is \$12,541,204).

[5] Includes support for research projects addressing population health, tobacco, hepatitis, and breast cancer.

FIGURE 3.4.2
DISTRIBUTION OF CANCER RESEARCH INVESTMENT BY CSO CATEGORY FOR FUNDING MECHANISMS, 2008 AND 2012



		Operating grants	Equipment / infrastructure grants	Career awards	Trainee awards	Related support grants
Investment (\$ millions)	2008	243.2	169.6	44.6	29.0	0.8
	2012	299.7	160.8	50.0	29.3	1.8
Percentage change from 2008 to 2012		23	-5	12	1	116

TABLE 3.4.2

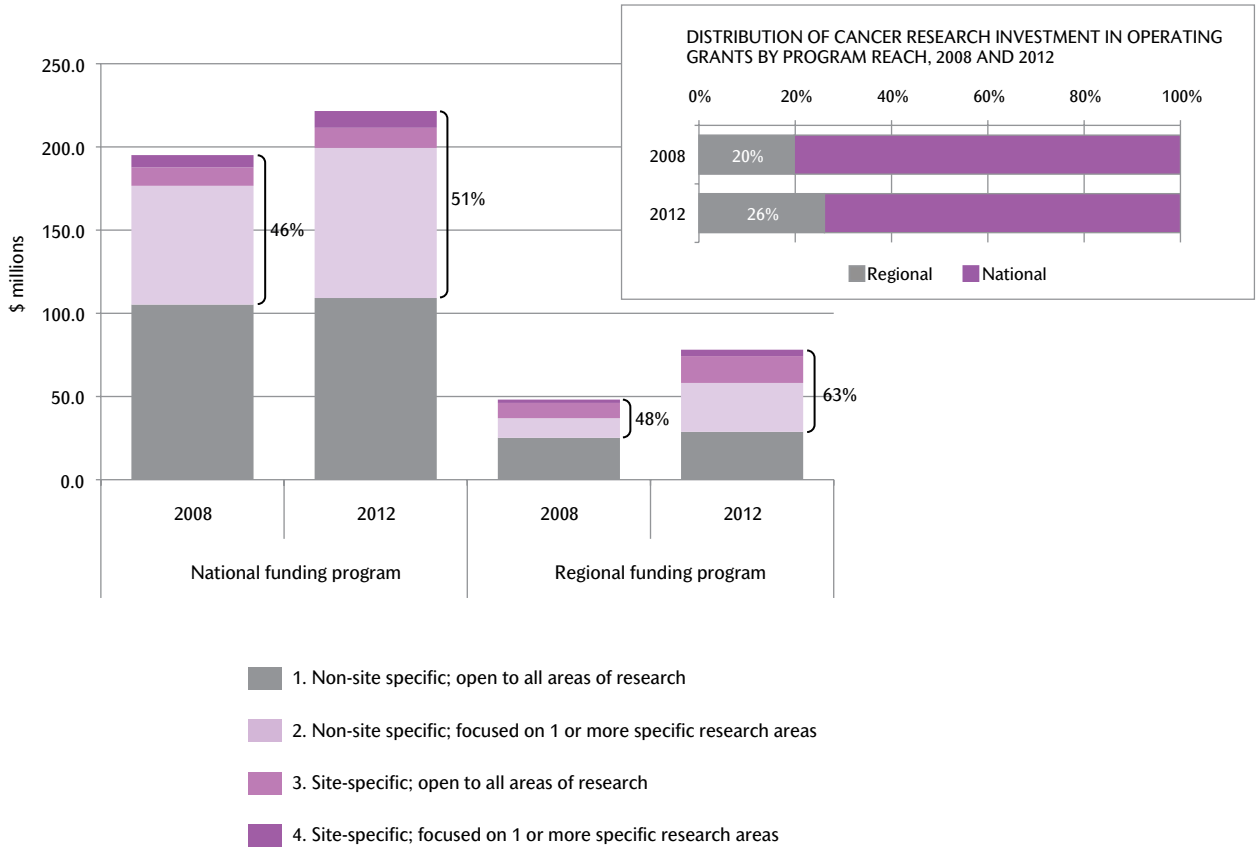
2012 CANCER RESEARCH INVESTMENT BY FUNDING MECHANISM AND PROVINCE OF NOMINATED PI

Province		Operating grants	Equipment/ infrastructure grants	Career awards	Trainee awards [1]	Related support grants	TOTAL
B.C.	\$	38,369,294	16,264,621	3,956,287	3,366,663	337,876	62,294,739
	%	62	26	6	5	1	100
Alta.	\$	23,838,265	10,022,692	7,745,911	3,083,838	88,037	44,778,744
	%	53	22	17	7	0	100
Sask.	\$	2,926,377	461,675	126,000	313,008	140,231	3,967,291
	%	74	12	3	8	4	100
Man.	\$	5,059,562	1,732,294	1,201,583	836,999	29,652	8,860,090
	%	57	20	14	9	0	100
Ont.	\$	156,424,640	97,514,803	22,977,091	11,768,411	901,719	289,586,665
	%	54	34	8	4	0	100
Que.	\$	67,279,928	31,201,743	12,496,007	6,060,274	262,122	117,300,074
	%	57	27	11	5	0	100
N.B.	\$	616,767	696,385	180,000	58,608	22,917	1,574,677
	%	39	44	11	4	1	100
N.S.	\$	4,578,591	2,191,889	972,667	1,016,141	33,314	8,792,602
	%	52	25	11	12	0	100
P.E.I.	\$	39,262	0	100,000	35,000	0	174,262
	%	23	0	57	20	0	100
N.L.	\$	573,863	715,811	212,467	77,950	6,750	1,586,841
	%	36	45	13	5	0	100
TOTAL	\$	299,707,019	160,802,122	49,968,152	26,616,967	1,822,625	538,916,885
	%	56	30	9	5	0	100

[1] Excludes trainee awardees studying outside of Canada.

FIGURE 3.4.3

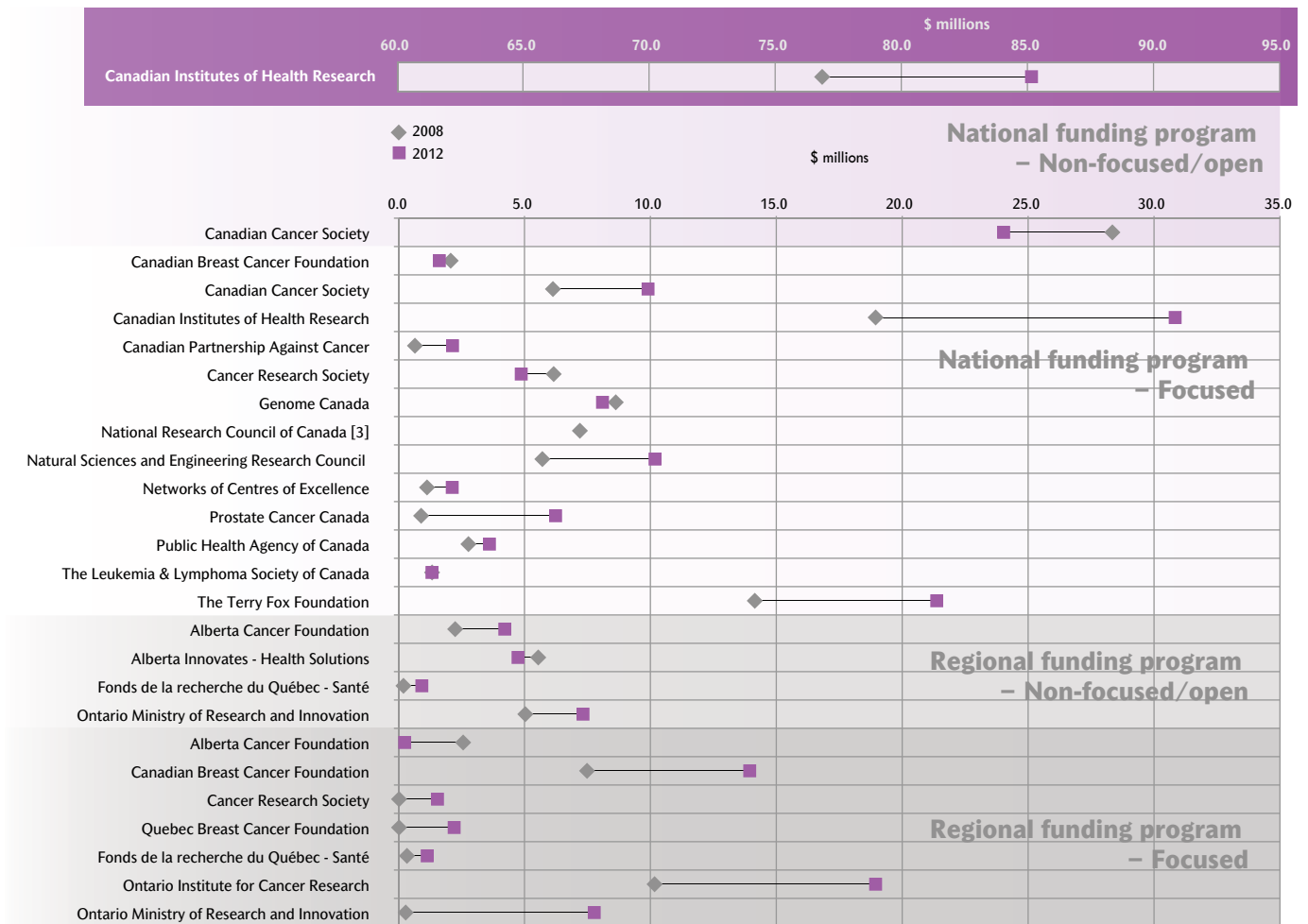
CANCER RESEARCH INVESTMENT IN OPERATING GRANTS BY PROGRAM REACH AND FOCUS [1], 2008 AND 2012



[1] Percentages shown represent the proportions of the overall operating grant investment in groups 2, 3 and 4.

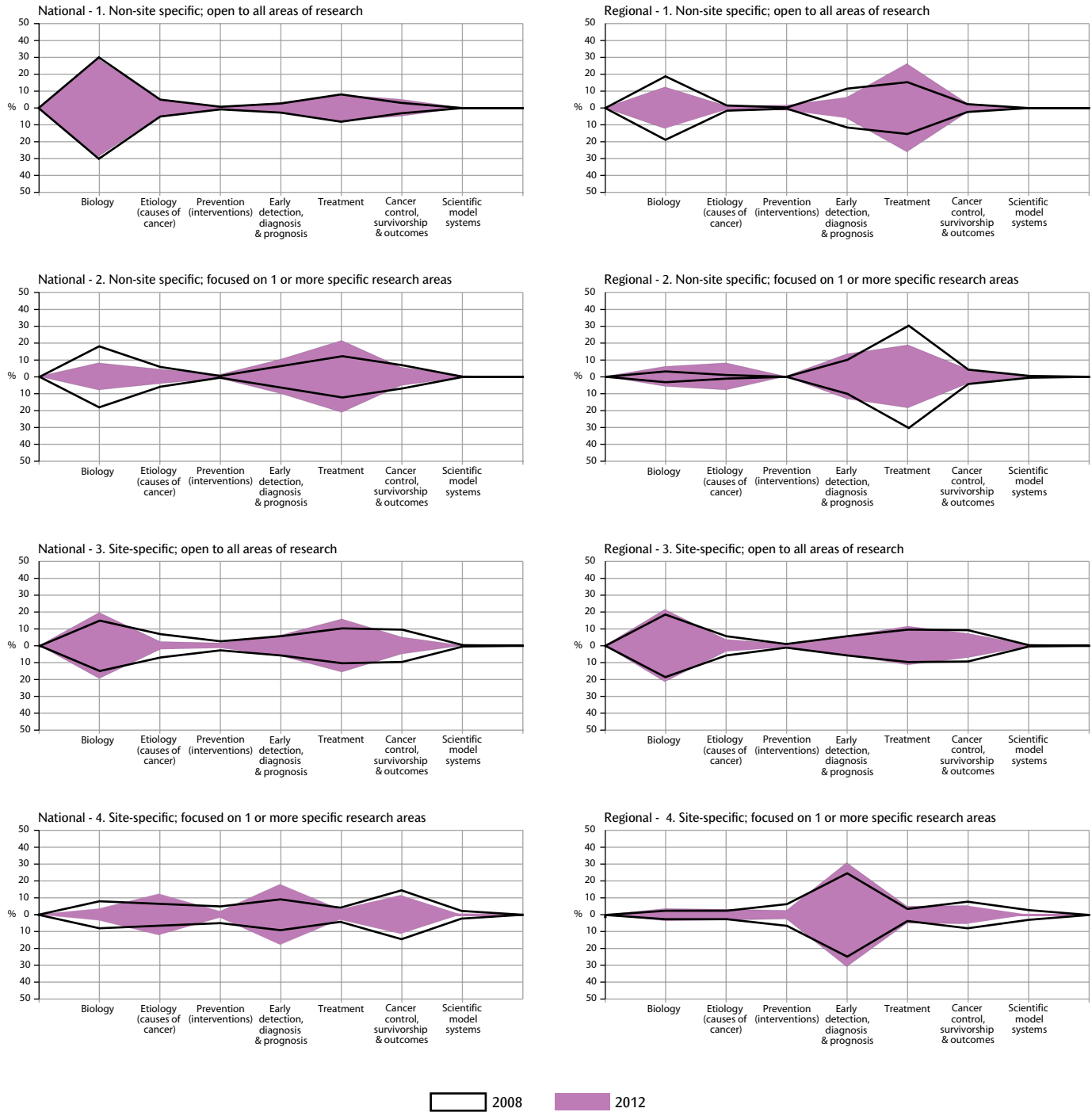
FIGURE 3.4.4

CANCER RESEARCH INVESTMENT IN OPERATING GRANTS BY PROGRAM REACH AND FOCUS [1] FOR SELECTED FUNDERS [2], 2008 AND 2012



[1] "Focused" funding programs are those that are restricted to specific on cancer sites and/or research areas.
 [2] In each group, the funders shown accounted for at least 60% of the investment.
 [3] NRC did not report new data for 2012.

FIGURE 3.4.5
DISTRIBUTION OF CANCER RESEARCH INVESTMENT IN OPERATING GRANTS BY CSO CATEGORY FOR FUNDING PROGRAMS, 2008 AND 2012



2008 2012

1. Non-site specific; open to all areas of research 2. Non-site specific; focused on 1 or more specific research areas 3. Site-specific; open to all areas of research 4. Site-specific; focused on 1 or more specific research areas

National funding program	Investment (\$ millions)	2008	105.3	71.4	11.1	7.4
		2012	109.2	90.2	12.1	10.1
Percent change from 2008 to 2012		4	26	9	37	
Regional funding program	Investment (\$ millions)	2008	25.2	11.8	9.2	2.0
		2012	28.8	29.4	16.1	3.8
Percent change from 2008 to 2012		14	149	75	92	

3.5 PRINCIPAL INVESTIGATORS

For the 2008 to 2012 period, there were 2,289 nominated principal investigators who had at least one operating grant, equipment award or career award with a cancer weighting of 80% or higher. Men formed two-thirds of the overall group and a large proportion (42%) worked in Ontario (Figure 3.5.1).

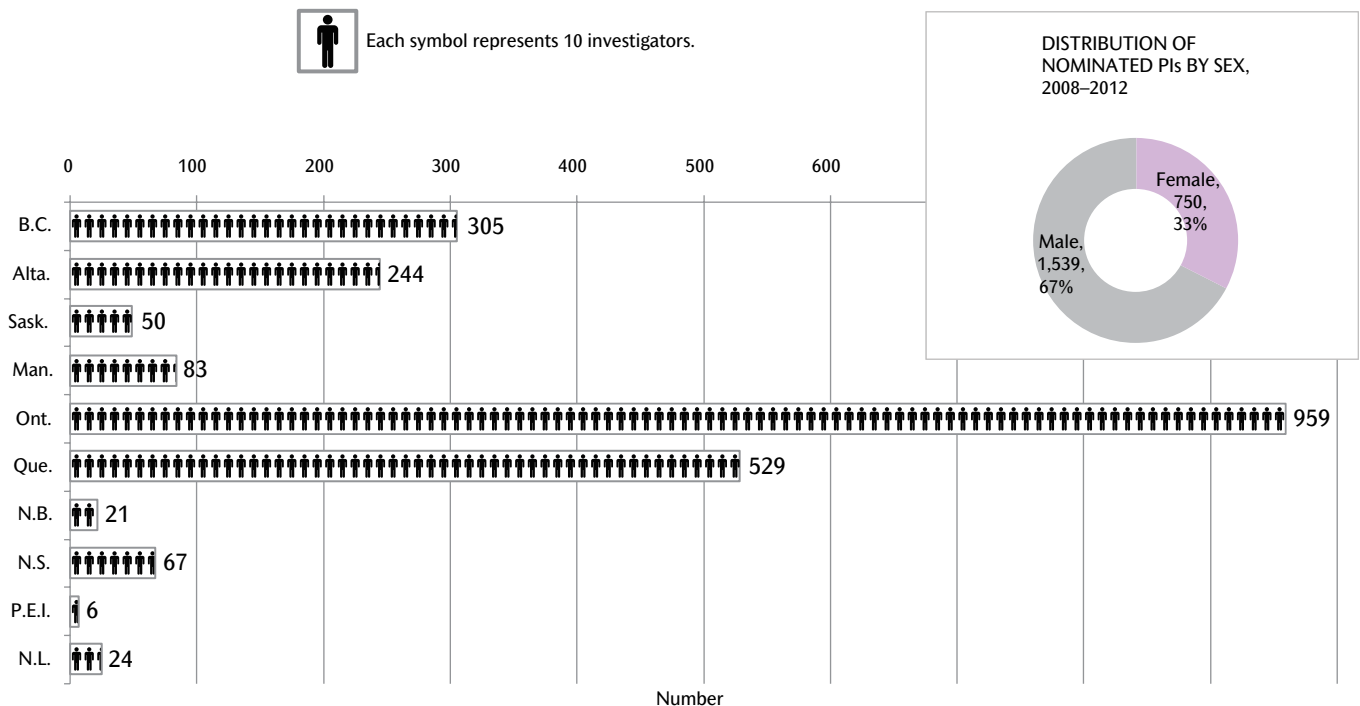
Most PIs had doctorate degrees (64%). An additional 26% had MDs and 9% had MDs plus PhDs (Figure 3.5.2A). The distribution by province revealed proportionately more PhD investigators in P.E.I. and proportionately more MDs in New Brunswick (Figure 3.5.2B).

In terms of operating grants for the 2008 to 2012 period, 10% had one or more co-PIs. (Figure 3.5.3). Of the 615 co-PIs, 58% (358) were included in the 2,289 PIs described above.

TREND SUMMARY

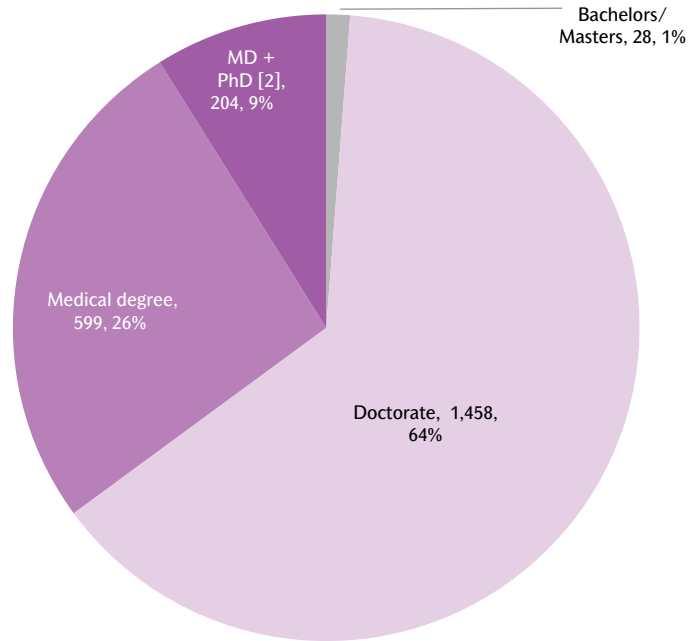
- Doctorate-level cancer researchers formed the bulk of PIs funded during the five-year period.
- Nine of every ten operating grants were led by one PI.

FIGURE 3.5.1
NUMBER OF NOMINATED PIS BY PROVINCE [1], 2008-2012



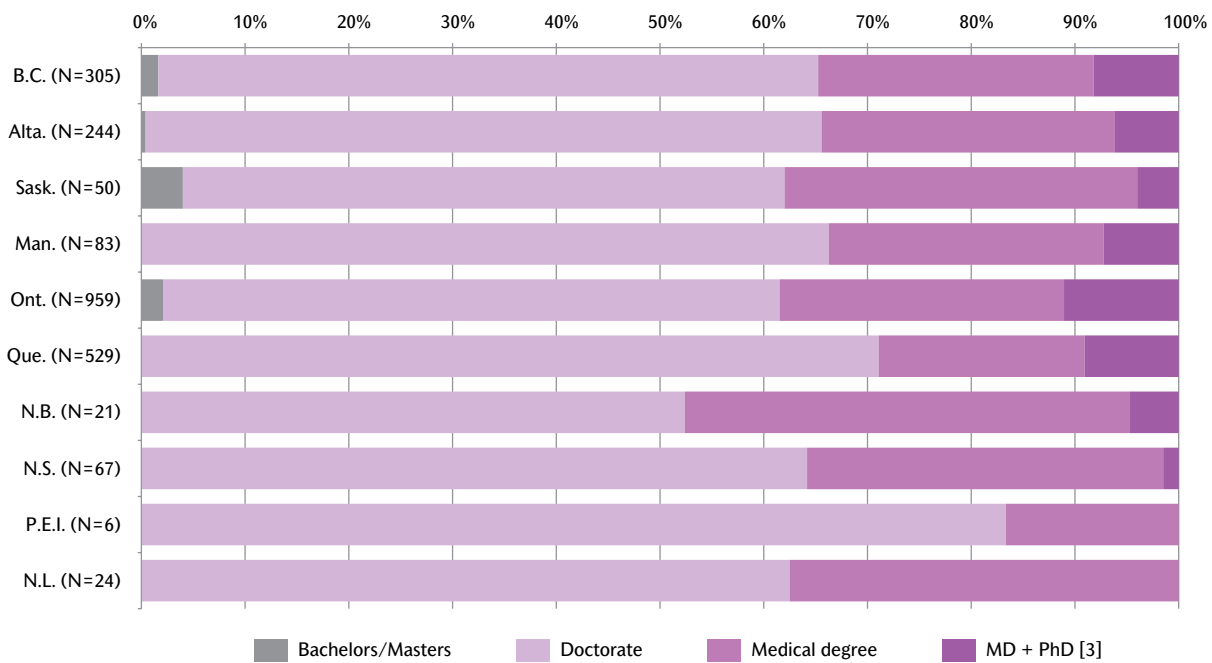
[1] Includes 2,289 nominated principal investigators who had at least one operating grant, equipment award or career award in the 2008 to 2012 period with a cancer weighting of 80% or higher. One PI from Yukon not shown.

FIGURE 3.5.2A
DISTRIBUTION OF NOMINATED PIS BY QUALIFICATIONS [1], 2008-2012



[1] Highest degree attained. Based on submitted and publicly available sources.
 [2] Includes investigators who had both a doctorate degree (PhD) plus a medical degree (MD), veterinary medicine degree (DVM), dentistry degree (DDS), or equivalent.

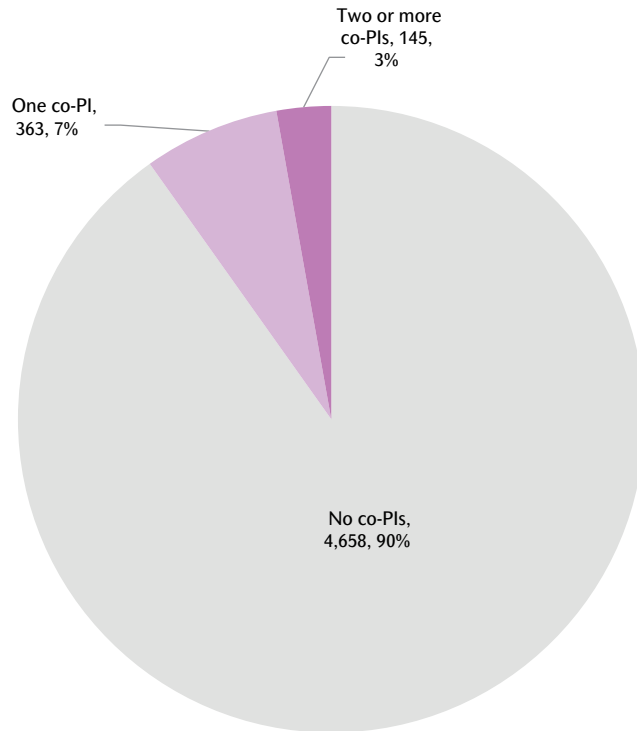
FIGURE 3.5.2B
DISTRIBUTION OF NOMINATED PIS BY QUALIFICATIONS [1] FOR PROVINCES [2], 2008-2012



[1] Highest degree attained. Based on submitted and publicly available sources.
 [2] One PI from Yukon not shown.
 [3] Includes investigators who had both a doctorate degree (PhD) plus a medical degree (MD), veterinary medicine degree (DVM), dentistry degree (DDS), or equivalent.

FIGURE 3.5.3

DISTRIBUTION OF NUMBER OF CO-PIs FOR OPERATING GRANTS [1], 2008-2012



[1] Includes only operating grants with a cancer weighting of 80% or higher. There were 615 co-PIs.

APPENDIX A. ABBREVIATIONS

AIHS	Alberta Innovates – Health Solutions
CBCF	Canadian Breast Cancer Foundation
CCRA	Canadian Cancer Research Alliance
CCRS	Canadian Cancer Research Survey
CCS	Canadian Cancer Society
CECR	Centres of Excellence for Commercialization and Research
CFI	Canada Foundation for Innovation
CIHR	Canadian Institutes of Health Research
CIPI	Canadian Institute for Photonic Innovations (an NCE)
CSO	Common Scientific Outline
ICD-10	International Statistical Classification of Disease and Related Health Problems, 10 th Revision
ICRP	International Cancer Research Partnership
MITACS	Mathematics of Information Technology & Complex Systems (an NCE)
NCE	Networks of Centres of Excellence
NRC	National Research Council of Canada
NSERC	Natural Sciences and Engineering Research Council
OICR	Ontario Institute for Cancer Research
OMRI	Ontario Ministry of Research and Innovation
PHAC	Public Health Agency of Canada
PI	Principal Investigator
SCN	Stem Cell Network (an NCE)
SSHRC	Social Sciences and Humanities Research Council

APPENDIX B. DATA CAVEATS FOR PARTICIPATING ORGANIZATIONS/PROGRAMS

ORGANIZATION [1]	NUMBER OF PROJECTS [2]	CAVEATS		
		PROJECT DESCRIPTIONS [3]	IMPUTED BUDGETS	IMPUTED START &/ END DATES
Alberta Cancer Foundation	478	11 with no descriptions; 73 with only lay abstracts	1 project	5 projects
Alberta Innovates - Health Solutions	317	1 with no description; 7 with only lay abstracts	55 career awards	
Atlantic Canada Opportunities Agency	3	No descriptions available	All projects	All dates imputed
Brain Tumour Foundation of Canada	47	Only lay abstracts provided		
Breast Cancer Society of Canada	112	26 with no descriptions; 68 with only lay abstracts	72 projects	98 projects
C ¹⁷ Research Network	35	Only lay abstracts provided		
Canada Excellence Research Chairs	1	No description available		
Canada Foundation for Innovation	440	Keywords only; no descriptions available	CFI maximum contribution used for CFI. Partner investment is assumed as 2.25 times the CFI maximum contribution.	276 projects
Canada Research Chairs Program	467	Descriptions obtained from website		
Canadian Association of Radiation Oncology	71	7 with no descriptions		13 projects
Canadian Breast Cancer Foundation	533	5 with no descriptions; 45 with only lay abstracts		
Canadian Breast Cancer Research Alliance	133			
Canadian Cancer Research Alliance	1			
Canadian Cancer Society	1,051	10 with no descriptions; 35 with only lay abstracts	2 projects	2 projects
Canadian Institutes of Health Research	3,996	51 with no descriptions; 696 with only lay abstracts	21 projects	12 projects
Canadian Partnership Against Cancer	10	7 with no descriptions; 3 with only lay abstracts		
Canadian Prostate Cancer Research Initiative	1			
Canadian Tobacco Control Research Initiative	70	67 with only lay abstracts		
Canary Foundation of Canada	7			
CancerCare Manitoba	68	1 with only lay abstract		
Cancer Care Nova Scotia	57	Only lay abstracts provided		All dates imputed
Cancer Care Ontario	63	16 with no descriptions; 47 with only lay abstracts		
Cancer Research Society	305	4 with only lay abstracts		
Cole Foundation	105	Only lay abstracts provided		All dates imputed
Fondation du cancer du sein du Québec / Quebec Breast Cancer Foundation	24			
Fonds de la recherche du Québec - Santé	635	22 with no descriptions; 61 with only lay abstracts		
Genome Canada	14	13 with only lay abstracts		
Michael Smith Foundation for Health Research	248	67 with only lay abstracts	2 projects	4 projects
National Research Council Canada	42	16 with only lay abstracts		
Natural Sciences and Engineering Research Council	1,122	604 with no descriptions; 517 with only lay abstracts	120 trainee awards	165 projects
Networks of Centres of Excellence	130	2 with no descriptions; 128 with only lay abstracts	66 projects	91 projects
New Brunswick Health Research Foundation	11			
Newfoundland and Labrador Centre for Applied Health Research	7	Only lay abstracts provided	3 projects	
Nova Scotia Health Research Foundation	63	1 with no description; 60 with only lay abstracts	1 project	28 projects
Ontario Institute for Cancer Research	397	43 with no descriptions; 108 with only lay abstracts		
Ontario Ministry of Research and Innovation	101	10 with no descriptions; 89 with only lay abstracts	OMIR investment is known for all projects. Partner investment is estimated for 79 projects.	62 projects
Ovarian Cancer Canada	36	14 with no descriptions; 22 with only lay abstracts		15 projects
PROCURE	1			
Pancreatic Cancer Canada	8	7 with only lay descriptions	2 projects	All dates imputed
Pediatric Oncology Group of Ontario	36	28 with only lay descriptions		2 projects
Prostate Cancer Canada	117	5 with no descriptions		
Research Manitoba	119	28 with no descriptions; 75 with only lay abstracts	1 project	1 project
Saskatchewan Cancer Agency	25	1 with only lay description		
Saskatchewan Health Research Foundation	43	Only lay abstracts provided		
Social Sciences and Humanities Research Council	94	No descriptions available		36 projects
The Kidney Foundation of Canada	12			
The Leukemia & Lymphoma Society of Canada	139	50 studentships with no descriptions		
The Terry Fox Foundation	352	5 with no descriptions; 34 with only lay abstracts		

[1] Projects are listed under the program that administered them. This list does not contain the Indirect Costs Program given that this is an estimate calculated on the basis of institution-specific funding for CIHR, NSERC, and SSHRC.

[2] Number of projects included in the CCRA database for 2008–2012. Overall total is 12,147.

[3] Descriptions are important to the coding/project classification process. The more information available for a given project, the more confidence we have in the classification results. Where no descriptions were available, public information (i.e., thesis abstracts, publications, web-based information) was used to code a given project.

[4] Budgets were imputed on the basis of similar grants for which data were available or other public information.

[5] Dates were imputed on the basis of similar grants for which data were available or other public information.

APPENDIX C. CANCER RESEARCH INVESTMENT BY PARTICIPATING ORGANIZATIONS/PROGRAMS, 2008-2012

CSO Code	\$					Percent change from 2008 to 2012
	2008	2009	2010	2011	2012	
FEDERAL GOVERNMENT [2]	230,354,749	260,305,622	254,510,616	259,356,359	254,245,181	10.37
Canada Foundation for Innovation	37,451,290	49,402,515	48,877,864	46,982,577	37,218,927	-0.62
Canada Research Chairs Program	21,815,917	21,665,917	22,091,421	21,616,585	21,658,130	-0.72
Canadian Institutes of Health Research	122,047,803	132,373,727	135,893,618	145,482,088	146,087,540	19.70
Canadian Partnership Against Cancer	10,137,443	12,866,530	8,916,695	9,176,896	13,035,081	28.58
Genome Canada	13,625,276	13,278,435	6,955,334	7,318,104	9,192,381	-32.53
National Research Council of Canada [3]	7,341,680	8,920,547	9,030,126	2,262,644	-	-
Natural Sciences and Engineering Research Council	10,556,332	14,095,226	15,167,120	16,503,880	16,620,022	57.44
Networks of Centres of Excellence [4]	1,177,873	560,854	729,108	1,247,038	2,653,985	125.32
Public Health Agency of Canada	2,844,979	3,035,366	3,130,931	4,311,324	3,760,649	32.19
Social Sciences and Humanities Research Council	2,522,144	3,233,572	3,220,894	3,035,457	2,598,698	3.04
Other Federal agency	834,012	872,931	497,505	1,419,767	1,419,767	70.23
PROVINCIAL GOVERNMENT	115,731,669	144,976,882	136,198,523	146,890,930	131,624,428	13.73
PROVINCIAL CANCER AGENCY	8,252,078	8,088,785	8,599,746	9,608,045	7,723,700	-6.40
CancerCare Manitoba	955,520	974,130	964,448	951,321	732,537	-23.34
Cancer Care Nova Scotia	336,250	229,813	173,650	444,217	451,050	34.14
Cancer Care Ontario	6,552,871	6,544,358	7,130,231	7,757,912	5,963,148	-9.00
Saskatchewan Cancer Agency	407,438	340,485	331,417	454,596	576,965	41.61
PROVINCIAL HEALTH RESEARCH ORGANIZATION	74,226,267	103,699,988	101,689,963	114,163,081	105,188,813	41.71
Alberta Innovates - Health Solutions	17,567,168	16,493,711	14,013,344	17,043,312	12,957,101	-26.24
Fonds de la recherche du Québec - Santé	10,104,494	11,460,575	11,934,467	12,058,289	12,593,308	24.63
Michael Smith Foundation for Health Research	8,465,447	6,584,052	4,012,094	3,663,594	2,622,655	-69.02
New Brunswick Health Research Foundation	66,826	54,632	89,191	161,777	240,540	259.95
Newfoundland and Labrador Centre for Applied Health Research	31,750	54,101	50,224	19,333	44,935	41.53
Nova Scotia Health Research Foundation	577,073	651,302	564,322	401,682	384,115	-33.44
Ontario Institute for Cancer Research	30,674,665	54,320,017	51,768,613	58,978,847	57,728,394	88.20
Ontario Ministry of Research and Innovation	5,384,753	12,670,919	17,887,767	20,417,724	17,264,303	220.61
Research Manitoba [5]	842,267	1,012,122	853,741	848,936	946,196	12.34
Saskatchewan Health Research Foundation	511,824	398,557	516,200	569,586	407,268	-20.43
OTHER PROVINCIAL AGENCY	33,253,324	33,188,109	25,908,815	23,119,803	18,711,915	-43.73
VOLUNTARY ORGANIZATION	109,026,131	119,461,819	121,628,858	125,354,466	131,226,529	20.36
Alberta Cancer Foundation	11,298,929	11,082,045	11,659,905	10,971,234	10,874,891	-3.75
Brain Tumour Foundation of Canada	370,044	253,281	174,029	346,357	306,622	-17.14
Breast Cancer Society of Canada	358,399	572,666	619,448	831,822	1,176,861	228.37
C17 Research Network	325,860	467,694	440,338	708,233	836,626	156.74
Canadian Association of Radiation Oncology	349,042	443,842	347,217	382,256	345,492	-1.02
Canadian Breast Cancer Foundation	11,656,651	13,896,027	15,097,681	15,645,671	18,431,614	58.12
Canadian Cancer Society	44,641,039	43,809,015	41,809,373	40,152,160	39,656,059	-11.17
Cancer Research Society	6,423,874	5,204,103	4,564,168	5,487,011	6,651,475	3.54
Cole Foundation	874,417	1,245,000	1,625,083	1,538,000	1,584,333	81.19
Fondation du cancer du sein du Québec/Quebec Breast Cancer Foundation	19,917	1,215,443	1,278,878	1,306,665	2,312,606	11511.41
Ovarian Cancer Canada	298,991	439,372	85,000	249,619	293,333	-1.89
PROCURE	495,092	505,503	476,210	696,000	600,000	21.19
Pancreatic Cancer Canada	75,000	75,000	130,000	90,000	145,000	93.33
Pediatric Oncology Group of Ontario	164,818	154,059	207,221	163,162	179,810	9.10
Prostate Cancer Canada	896,408	1,464,891	3,229,861	6,705,102	7,076,390	689.42
The Kidney Foundation of Canada	147,500	190,000	222,125	220,700	185,872	26.01
The Leukemia & Lymphoma Society of Canada	1,450,975	1,783,912	1,584,940	1,353,221	1,365,035	-5.92
The Terry Fox Foundation [6]	19,923,644	22,275,718	23,639,826	24,277,339	25,049,262	25.73
Other charitable organization	9,255,532	14,384,248	14,437,555	14,229,914	14,155,248	52.94
OTHER [7]	32,140,986	36,926,526	31,788,520	30,283,303	24,494,048	-23.79
TOTAL	487,253,535	561,670,849	544,126,517	561,885,057	541,590,186	11.15

[1] Organizations are listed alphabetically under the relevant funding sector (sector totals are shown in bolded, upper case letters).

[2] This figure does not include the estimate of the cancer-relevant federal Indirect Costs Program (\$23.3M) as shown in Table 3.4.1.

[3] NRC did not report data for 2012.

[4] NCE figure does not include funding from CIHR, NSERC or SSHRC for network management activities, but does reflect investment in cancer-relevant projects supported by specific networks (CIPI, MITACS, and SCN). CIHR, NSERC and SSHRC contributions to nine CECRs are also included in the total shown.

[5] Manitoba Health Research Council was transitioned to Research Manitoba in 2014.

[6] Investment shown for The Terry Fox Foundation includes the projects supported by The Terry Fox Research Institute.

[7] Other partner/leveraged funding.

APPENDIX D. CANCER RESEARCH INVESTMENT BY CSO CODES, 2008–2012

CSO Code	\$					Percent change from 2008 to 2012
	2008	2009	2010	2011	2012	
1 - BIOLOGY	180,785,137	181,426,004	169,587,252	164,824,619	156,213,693	-13.59
1.1 - Normal functioning	68,343,694	70,736,751	65,513,242	64,582,948	56,179,119	-17.80
1.2 - Cancer initiation: alterations in chromosomes	12,139,037	12,447,827	12,804,363	12,631,631	13,130,896	8.17
1.3 - Cancer initiation: oncogenes and tumour suppressor genes	48,916,464	47,609,951	41,992,095	37,907,856	36,319,429	-25.75
1.4 - Cancer progression and metastasis	27,905,007	30,096,634	30,356,052	31,964,721	34,561,471	23.85
1.5 - Resources and infrastructure	23,480,935	20,534,840	18,921,500	17,737,462	16,022,779	-31.76
2 - ETIOLOGY	65,786,613	82,592,732	79,752,124	86,683,199	83,305,914	26.63
2.1 - Exogenous factors in the origin and cause of cancer	28,706,356	30,641,607	24,172,090	24,543,540	25,285,376	-11.92
2.2 - Endogenous factors in the origin and cause of cancer	20,007,362	22,993,722	25,537,988	28,026,790	28,696,400	43.43
2.3 - Interactions of genes and/or genetic polymorphisms with exogenous and/or endogenous factors	10,265,468	10,511,956	6,859,547	7,931,828	8,870,647	-13.59
2.4 - Resources and infrastructure	6,807,427	18,445,448	23,182,498	26,181,041	20,453,490	200.46
3 - PREVENTION	11,064,721	14,038,173	13,676,873	13,501,810	13,176,858	19.09
3.1 - Interventions to prevent cancer: personal behaviours that affect cancer risk	4,633,424	4,534,889	4,032,557	3,584,340	3,234,703	-30.19
3.2 - Nutritional science in cancer prevention	841,499	2,100,734	2,622,382	2,247,767	1,701,810	102.24
3.3 - Chemoprevention	1,140,547	1,253,752	1,298,089	1,806,804	2,269,722	99.00
3.4 - Vaccines	753,580	824,961	616,816	503,718	573,180	-23.94
3.5 - Complementary and alternative prevention approaches	353,599	240,977	218,160	143,668	276,522	-21.80
3.6 - Resources and infrastructure	3,342,072	5,082,860	4,888,869	5,215,512	5,120,920	53.23
4 - EARLY DETECTION, DIAGNOSIS & PROGNOSIS	60,079,082	74,643,155	66,753,277	77,808,412	75,471,964	25.62
4.1 - Technology development and/or marker discovery	22,111,072	27,738,002	25,570,408	31,462,351	31,459,131	42.28
4.2 - Technology and/or marker evaluation with respect to fundamental parameters of method	11,105,146	15,146,126	12,728,658	13,346,048	11,520,998	3.74
4.3 - Technology and/or marker testing in a clinical setting	6,928,429	8,831,465	8,869,220	9,223,570	8,452,856	22.00
4.4 - Resources and infrastructure	19,934,434	22,927,562	19,584,992	23,776,443	24,038,979	20.59
5 - TREATMENT	121,755,740	149,770,752	157,309,658	163,898,336	157,915,100	29.70
5.1 - Localized therapies – discovery and development	10,288,974	14,912,425	18,441,800	20,595,043	18,005,345	75.00
5.2 - Localized therapies – clinical applications	3,812,388	3,667,093	4,127,230	3,915,948	4,204,282	10.28
5.3 - Systemic therapies – discovery and development	65,312,769	85,430,142	91,188,521	93,173,217	89,681,439	37.31
5.4 - Systemic therapies – clinical applications	6,871,229	6,367,291	7,474,711	8,115,924	8,130,354	18.32
5.5 - Combinations of localized and systemic therapies	965,525	1,253,718	1,721,365	1,793,100	2,192,046	127.03
5.6 - Complementary and alternative treatment approaches	252,963	475,373	575,961	540,476	510,736	101.90
5.7 - Resources and infrastructure	34,251,893	37,664,711	33,780,070	35,764,628	35,190,899	2.74
6 - CANCER CONTROL, SURVIVORSHIP & OUTCOMES	46,455,278	57,630,689	55,958,398	53,907,608	53,874,042	15.97
6.1 - Patient care and survivorship issues	11,003,038	13,647,776	14,870,751	13,727,003	15,067,241	36.94
6.2 - Surveillance	2,771,575	3,438,292	3,372,606	3,377,814	3,173,581	14.50
6.3 - Behaviour	5,325,327	5,553,338	4,806,876	5,483,708	6,414,953	20.46
6.4 - Cost analyses and health care delivery	10,312,286	13,965,928	14,238,514	11,649,074	11,307,799	9.65
6.5 - Education and communication	1,874,542	2,585,599	2,557,605	2,786,999	1,961,143	4.62
6.6 - End-of-life care	3,410,100	3,230,414	3,088,832	3,397,263	3,262,406	-4.33
6.7 - Ethics and confidentiality in cancer research	364,156	331,340	298,349	226,052	255,836	-29.75
6.8 - Complementary and alternative approaches for supportive care of patients and survivors	520,416	443,803	493,626	376,657	202,405	-61.11
6.9 - Resources and infrastructure	10,873,839	14,434,198	12,231,239	12,883,039	12,228,676	12.46
7 - SCIENTIFIC MODEL SYSTEMS	1,326,966	1,569,344	1,088,935	1,261,074	1,632,615	23.03
7.1 - Development and characterization of model systems	1,168,716	1,428,259	979,185	1,112,103	1,507,631	29.00
7.2 - Application of model systems	-	-	-	-	-	-
7.3 - Resources and infrastructure	158,249	141,085	109,750	148,971	124,984	-21.02
TOTAL	487,253,535	561,670,849	544,126,517	561,885,057	541,590,186	11.15

APPENDIX E. CANCER RESEARCH INVESTMENT BY CANCER SITES, 2008–2012 [1]

CANCER SITE	2008		2009		2010		2011		2012		Percent change from 2008 to 2012
	\$	%	\$	%	\$	%	\$	%	\$	%	
Bladder	1,269,564	0.54	1,725,076	0.64	1,827,637	0.65	1,264,303	0.44	1,140,068	0.40	-10.20
Bone and connective tissue	2,431,709	1.03	3,156,388	1.18	3,697,407	1.32	3,661,372	1.26	3,306,263	1.16	35.96
Brain	20,039,163	8.47	19,645,576	7.34	19,939,859	7.14	19,861,276	6.84	20,942,125	7.32	4.51
Breast	66,522,970	28.13	74,162,097	27.73	74,169,814	26.56	77,065,032	26.53	75,936,155	26.53	14.15
Cervix	5,274,295	2.23	5,479,669	2.05	5,401,175	1.93	5,095,441	1.75	5,573,024	1.95	5.66
Colorectal	17,267,738	7.30	19,919,075	7.45	20,697,041	7.41	20,453,262	7.04	19,253,624	6.73	11.50
Esophagus	1,931,425	0.82	2,225,374	0.83	2,116,682	0.76	2,296,506	0.79	1,554,115	0.54	-19.54
Gallbladder	47,267	0.02	66,936	0.03	43,136	0.02	14,787	0.01	44,706	0.02	-5.42
Hodgkin lymphoma	744,911	0.32	816,932	0.31	753,744	0.27	802,946	0.28	847,985	0.30	13.84
Kidney	2,892,432	1.22	3,759,259	1.41	3,761,530	1.35	3,979,804	1.37	3,702,193	1.29	28.00
Larynx	1,118,519	0.47	1,109,479	0.41	801,862	0.29	896,189	0.31	748,579	0.26	-33.07
Leukemias	27,088,904	11.46	26,679,688	9.97	30,502,971	10.92	32,260,541	11.10	32,483,000	11.35	19.91
Liver	3,627,565	1.53	3,605,557	1.35	3,858,214	1.38	3,731,552	1.28	4,098,731	1.43	12.99
Lung	16,467,157	6.96	20,903,832	7.81	20,829,608	7.46	20,980,732	7.22	19,238,937	6.72	16.83
Multiple myeloma	3,168,222	1.34	3,197,631	1.20	2,736,834	0.98	1,975,115	0.68	2,434,686	0.85	-23.15
Non-Hodgkin lymphoma	11,647,668	4.93	10,984,241	4.11	9,668,197	3.46	8,665,478	2.98	9,374,962	3.28	-19.51
Oral	4,704,171	1.99	5,773,496	2.16	6,003,526	2.15	6,307,767	2.17	7,174,678	2.51	52.52
Ovary	7,171,473	3.03	8,504,824	3.18	10,241,702	3.67	12,648,379	4.35	13,410,658	4.69	87.00
Pancreas	1,560,170	0.66	5,367,213	2.01	9,510,053	3.41	10,839,715	3.73	10,763,182	3.76	589.87
Prostate	26,910,924	11.38	33,014,200	12.34	32,902,631	11.78	38,053,635	13.10	37,867,919	13.23	40.72
Skin (Melanoma)	4,495,668	1.90	4,475,376	1.67	4,937,602	1.77	5,367,197	1.85	4,952,332	1.73	10.16
Stomach	988,413	0.42	1,020,078	0.38	970,569	0.35	1,166,712	0.40	1,583,449	0.55	60.20
Thyroid	622,011	0.26	523,014	0.20	458,851	0.16	565,814	0.19	488,530	0.17	-21.46
Uterus	1,411,028	0.60	1,688,926	0.63	1,893,203	0.68	1,776,151	0.61	1,471,794	0.51	4.31
Other sites	7,051,955	2.98	9,686,792	3.62	11,507,272	4.12	10,785,600	3.71	7,793,018	2.72	10.51
TOTAL	236,455,321	100	267,490,728	100	279,231,120	100	290,515,306	100	286,184,714	100	21.03

[1] This table excludes investment in research that is relevant to all cancer sites/not site-specific.

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