

CANCER RESEARCH INVESTMENT IN CANADA, 2016

HIGHLIGHTS

- In 2016, a total of \$473M was invested in cancer research by 42 organizations tracked in the Canadian Cancer Research Survey — this was the fourth lowest annual investment since 2005 and a significant decrease from the peak investment in 2011.
- As has been previously reported, the declining research investment over the latest four-year period was largely due to the conclusion of large-scale infrastructure investments made through programs offered by the Canada Foundation for Innovation (CFI) (which includes funding from CFI, its provincial partners, and other partners) and a levelling after the initial ramp-up of cancer research investment in Ontario.
- When examining the trends across three four-year periods by funders, it is noteworthy that 21 organizations had their highest investments in the latest four-year period.
- In 2016, three of every five dollars invested came from the following organizations: Canadian Institutes of Health Research, Ontario Institute for Cancer Research, Canadian Cancer Society, The Terry Fox Research Institute and the Natural Sciences and Engineering Research Council.
- At the regional level, priority-driven investment formed most of the operating grant investment. There is some evidence that the operating grant investment through investigator-initiated funding programs offered at the national level may be on the rise.
- The reduced infrastructure investment contributed to an overall decline in the investment in cancer biology research. A closer inspection revealed that the number of operating grants focused purely on cancer biology declined over time. This may be a function of the increased focus on translational research in tandem with the expanded number of priority-driven funding programs.
- The investment in treatment research re-bounded in 2015 and 2016 and represented one-third of the 2016 investment in cancer research. The prevention research investment (limited to prevention interventions in this context) was \$19M in 2016 (4% of the annual investment). For a fuller depiction of the cancer risk and prevention research investment, please consult our report, *Canada's Investment in Cancer Risk and Prevention Research, 2005-2016*.
- Over the 12 years, an increasing proportion of the research investment was specific to one or more cancer sites.
- Twelve of the 24 cancer sites/groups tracked had the highest investments in the latest four-year period with the research investments in prostate cancer, leukemias, and brain cancers showing the greatest increases.

This summary report describes the trend in the investment in cancer research in Canada for years 2005 to 2016, with a focus on the three four-year periods within this timeframe. Data come from the Canadian Cancer Research Survey (CCRS). The CCRS was designed to help inform CCRA members on how to optimize their research investment by addressing gaps, capitalizing on opportunities to partner on funding, and reducing duplication. The CCRS was the first joint activity undertaken by the CCRA.

Funding information is captured from 42 organizations/programs. The CCRS captures most of the peer-reviewed research from the governmental and voluntary sectors. It does not, however, include institution-specific funding from hospital foundations, research supported by private foundations or industry R&D unless part of funding partnerships of projects captured in the CCRA. We have estimated that coverage by the CCRS represents 60-80% of the overall cancer research funding in Canada.

This report was made possible by the Canadian Partnership Against Cancer, funded by Health Canada to work with Canada's cancer community to implement the Canadian Strategy for Cancer Control to reduce the incidence of cancer, lessen the likelihood of Canadians dying from cancer, and enhance the quality of life of those affected by cancer. The Partnership is committed to enhancing the cancer research environment in Canada through its support of the CCRA and CCRA's role in coordinating the cancer research funding system. As a member and funder of the CCRA, the Partnership collaborates with other member organizations to enable the strategy for cancer research in Canada.

The views expressed herein are those of the CCRA.

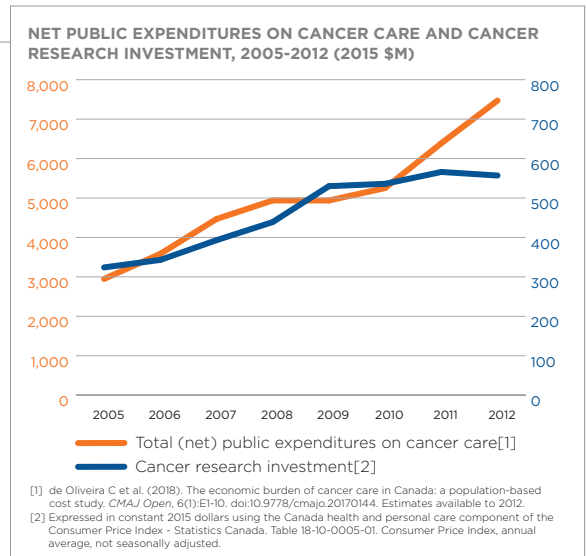
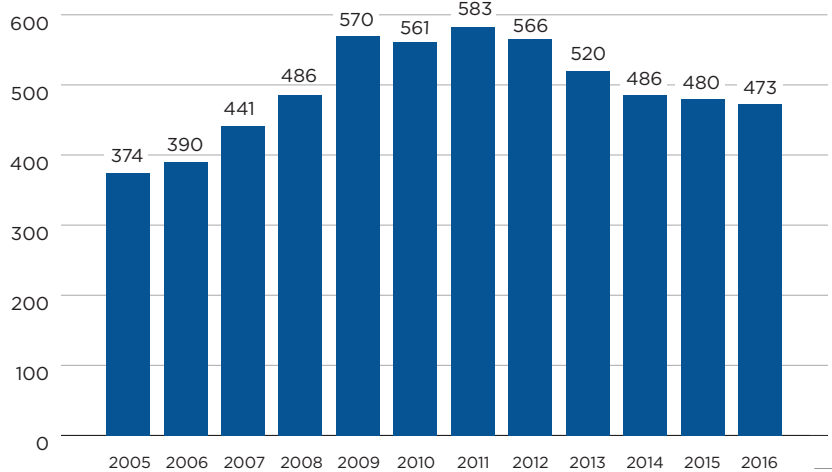


We are an alliance of organizations that collectively fund most of the cancer research conducted in Canada - research that will lead to better ways to prevent, diagnose, and treat cancer and improve survivor outcomes. Our members include federal research funding programs/agencies, provincial research agencies, provincial cancer care agencies, cancer charities, and other voluntary associations.

We are motivated by the belief that, through effective collaboration, Canadian cancer research funding organizations can maximize their collective impact on cancer control and accelerate discovery for the ultimate benefit of Canadians affected by cancer.

MARCH 2019

FIGURE 1
CANCER RESEARCH INVESTMENT, 2005-2016 (\$M)



DEFINITIONS OF FUNDING MECHANISMS

Operating grants support all the direct costs involved in conducting specific research projects including salaries for laboratory staff and research assistants, costs of supplies, samples, etc. The funding programs supporting these grants may be open (investigator-initiated) or focused on specific cancer sites and/or research areas (priority-driven).

Equipment/infrastructure grants cover the cost of new research facilities, equipment, software, databases, etc. needed for the research activities of one or more researchers.

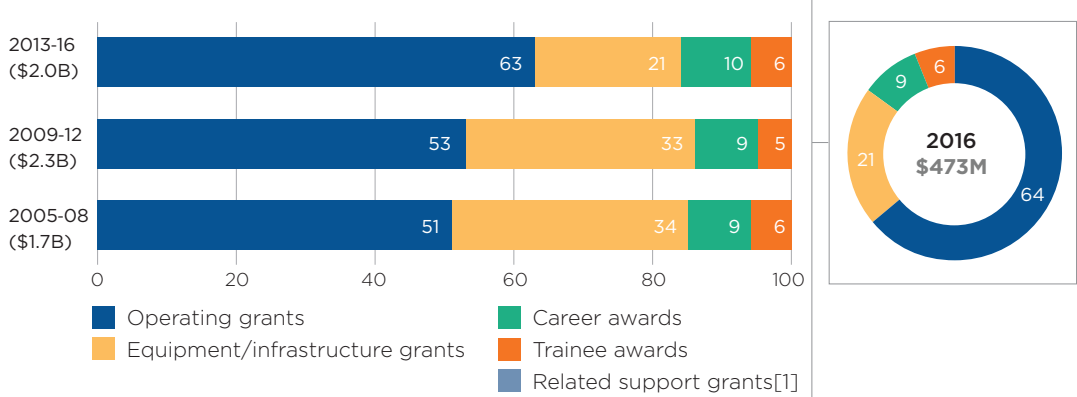
Career awards, also known as salary awards and/or research chairs, provide protected time for research.

Trainee awards support exceptional trainees during their undergraduate, graduate, or post-graduate training.

Related support grants cover conference travel, workshop sponsorship as well as researcher time for proposal development. For detailed definitions of funding mechanisms, please consult our 2008-2012 trends report.

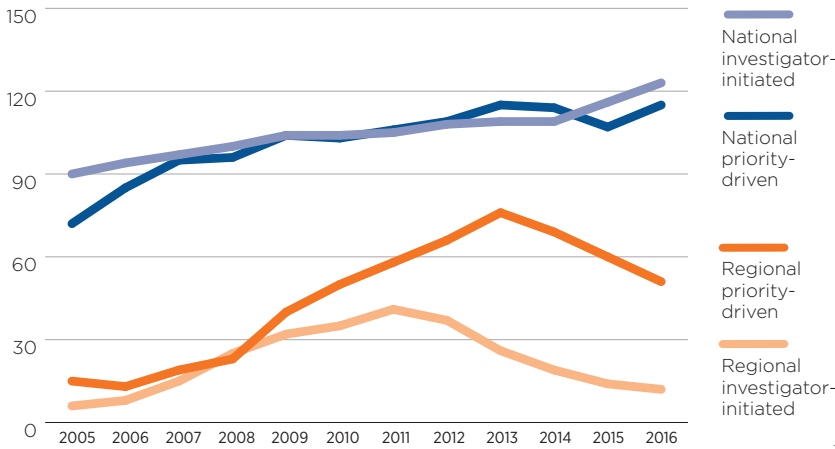
- Since its peak in 2011, the cancer research investment overall has shown a net decline (Figure 1). There was \$473M invested in 2016. Estimates of the total (net) public expenditures on cancer care from 2005 to 2012 more than doubled from the 2005 to 2012 period, a time when the cancer research investment was also on the upswing (inset).
- The distribution of the investment by funding mechanism showed the greatest decline in equipment/infrastructure during the latest four-year period and reflects the completion of several large-scale investments in research platforms and infrastructure (Figure 2). This trend has been previously reported.
- The investment in operating grants was \$301M in 2016, up slightly from \$297M in 2015. Operating grants represented 64% of the overall cancer research investment in 2016, approximately the same proportion as was found for the three previous years.
- The most notable trend in operating grants was the decline in investigator-initiated operating grants (Figure 3, next page). Although national programs appeared to be shifting towards more investigator-initiated investment (in 2016, \$123.0M was invested in investigator-initiated programs, which was the highest dollar amount over the 12-year period), the operating grant investment through regional programs was increasingly priority-driven. This trend will continue to be monitored.

FIGURE 2
INVESTMENT BY FUNDING MECHANISM, THREE PERIODS (%)

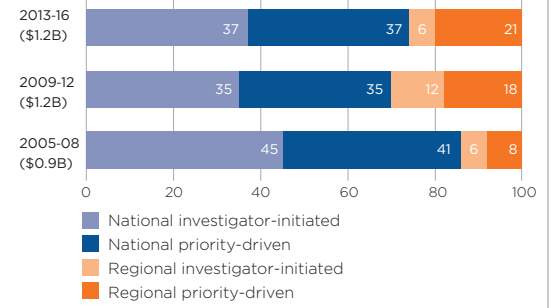


[1] Percentages for related support grants were less than 1% and are not labelled in the graph.

FIGURE 3
OPERATING GRANT INVESTMENT BY PROGRAM REACH AND TYPE, 2005-2016 (\$M)



OPERATING GRANT INVESTMENT BY PROGRAM REACH AND TYPE, THREE PERIODS (%)



- While the overall cancer research investment in the latest four-years was higher than the earliest four-year period, it was only among the charitable sector that there was growth. In 2015 and 2016, however, the investment by the charitable sector decreased, a trend that will continue to be monitored.
- As has been previously reported, the declining research investment over the latest four-year period was largely due to a sharp reduction in cancer-related infrastructure investment through programs offered by the Canada Foundation for Innovation (CFI) (which includes funding from CFI, its provincial partners, and other partners) and a levelling after the initial ramp-up of cancer research investment in Ontario. Twenty-one organizations tracked in this survey, however, had their highest investments in the latest four-year period (Figure 5, next page). Specifically, Prostate Cancer Canada had the highest percent rise in investment from the earliest to the latest four-year period.
- Three of every five dollars invested in 2016 came from the following: Canadian Institutes of Health Research (CIHR) \$149.0M; Ontario Institute for Cancer Research (OICR) \$53.5M; Canadian Cancer Society (CCS) \$38.3M; The Terry Fox Research Institute (TFRI) \$19.5M; and the Natural Sciences and Engineering Research Council (NSERC) \$19.0M.

IMPORTANT

Data are updated annually and will vary from previously published reports. Unless otherwise noted, investment figures presented are nominal, not adjusted for inflation. Figures may differ from those reported by contributing organizations because investments are prorated to calendar year periods.

FIGURE 4
INVESTMENT BY FUNDING SECTOR, THREE PERIODS (%)

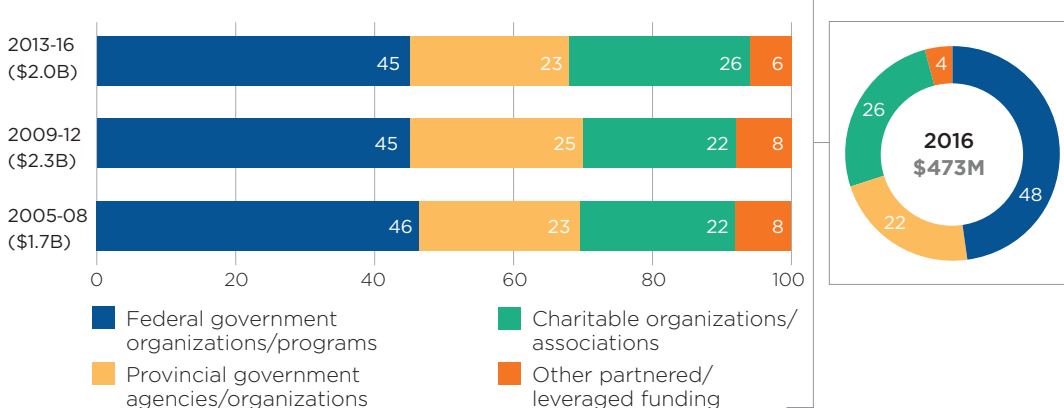
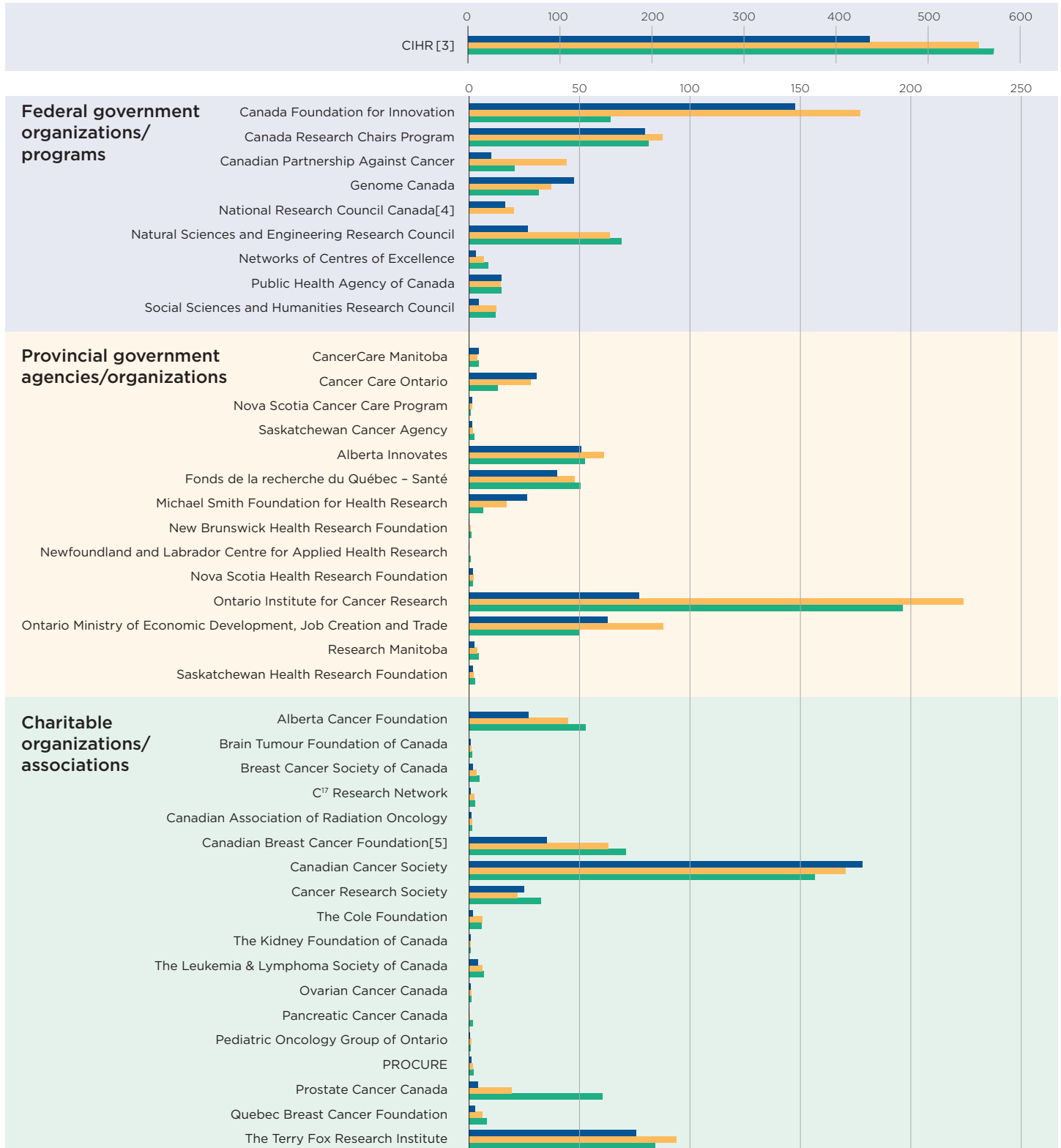


FIGURE 5
CANCER RESEARCH INVESTMENT BY PARTICIPATING ORGANIZATIONS/PROGRAMS, THREE PERIODS (\$M)[1,2]

■ 2005-08 ■ 2009-12 ■ 2013-16



[1] For detailed annual investment by funding organizations tracked in the CCRS from 2005 to 2016 as well as leveraged funding, please consult the supplementary data file available on the CCRA website.

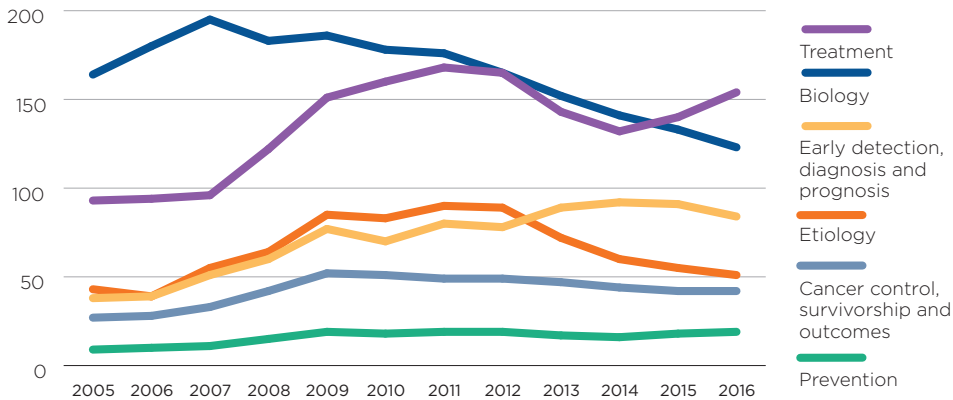
[2] Investments of less than \$2 million will be difficult to see on this graph.

[3] Data are shown separately for CIHR and the axis is scaled differently.

[4] Data are incomplete for the latest period and are not shown.

[5] As of February 1, 2017, the Canadian Cancer Society and the Canadian Breast Cancer Foundation have merged operations.

FIGURE 6
ANNUAL INVESTMENT BY CSO CATEGORY[1], 2005-2016 (\$M)



[1] For further information about the Common Scientific Outline (CSO), please see <https://www.icrpartnership.org/cso>.

FIGURE 7
OPERATING GRANT INVESTMENT BY CSO CATEGORY, THREE PERIODS (\$M)

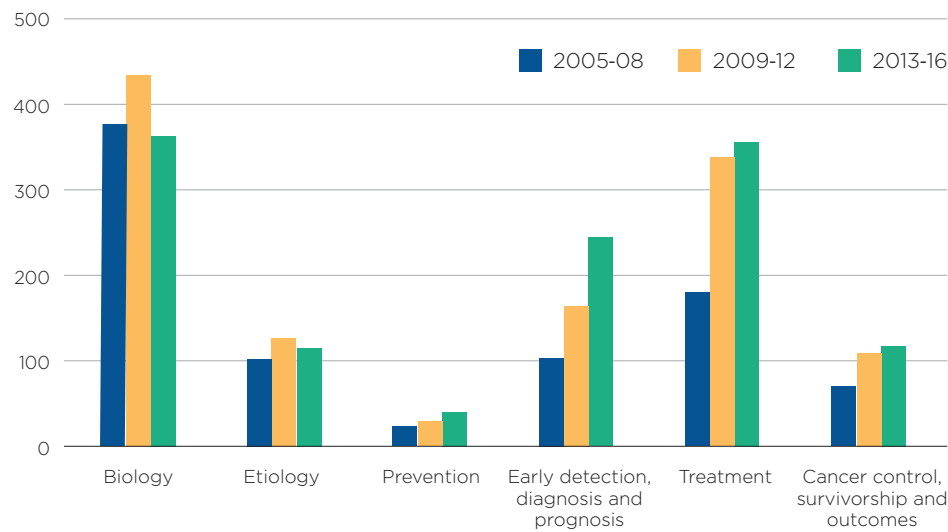
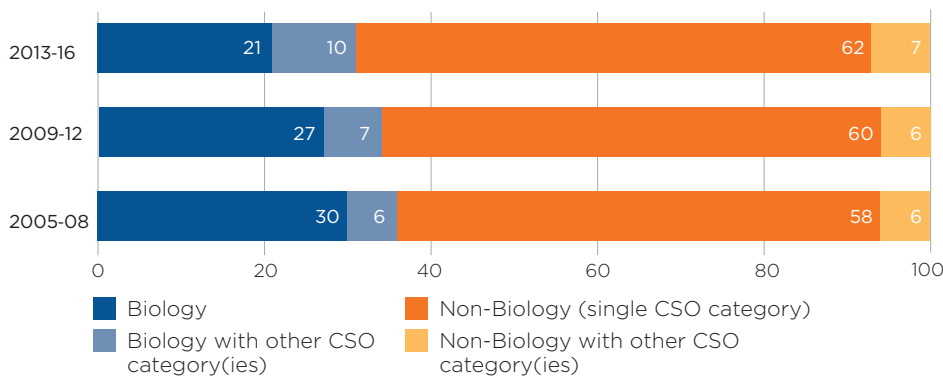


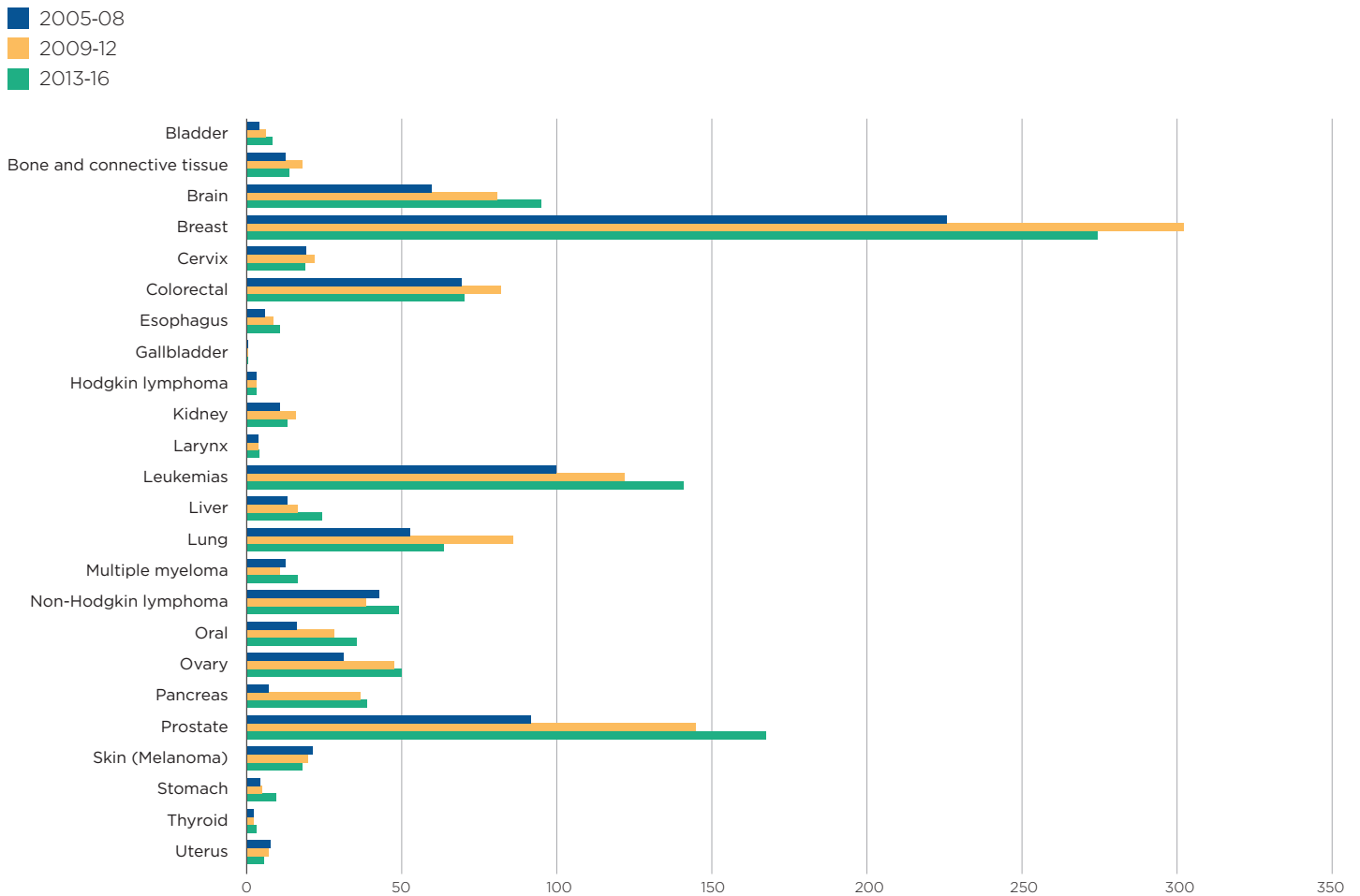
FIGURE 8
CANCER-FOCUSED OPERATING GRANTS BY CSO GROUPING, START YEAR PERIODS (%) [1]



[1] This graph uses a different methodology from the rest of the CSO graphs. Operating grants with a cancer-weighting at least 80% were grouped by their CSO coding into one of the four groups in the legend and by start year of the grant.

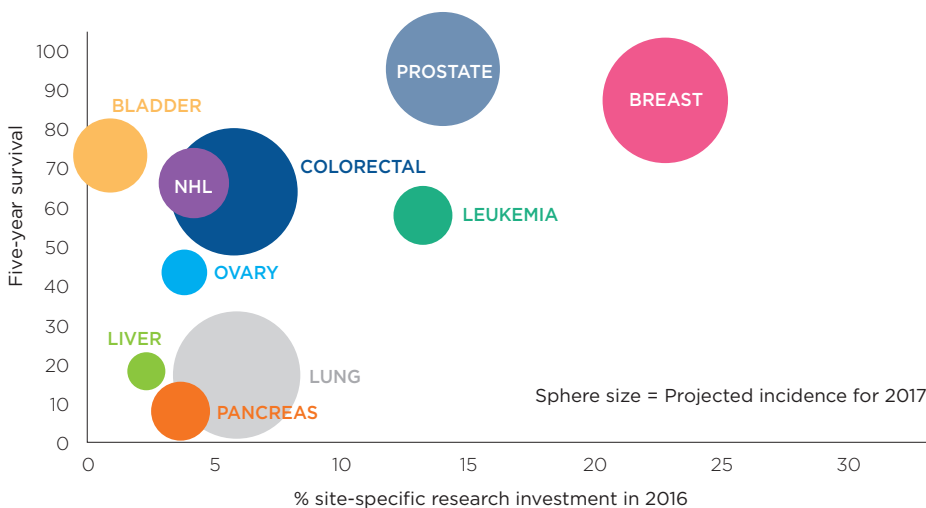
- Figure 6 captures the trend in the investment by area of science (Common Scientific Outline - CSO). This shows a substantial decline in the investment in Biology, which was largely a result of the significant drop in equipment/ infrastructure funding previously mentioned.
- The investment in Biology operating grants in 2016 was \$83M, the second lowest in the 12 years. The operating grant investment for Etiology also dropped, while for the other four CSO categories, the operating grant investment went up over time (Figure 7).
- A closer inspection of the operating grants showed that the proportion focused purely on cancer biology declined over time (Figure 8) This reflects the shift in emphasis on translational research as well as the trend towards increased investment through priority-driven programs.
- Over the 12-year period, the proportion of the investment focused on specific cancers grew. In 2016, for example, 60% of the investment was relevant to one or more cancer sites. Twelve of the 24 cancer sites/groups tracked had the highest investments in the latest four-year period (see Figure 9). The rise in the investment was notably for prostate cancer, leukemias, and brain cancers.
- Since our initial publication of the research investment data, CCRA has examined the relationship between the site-specific research investment and cancer burden. For 2016, the investment relative to two indicators of burden—new cancer cases and five-year net survival — suggests that there are cancers that may benefit from targeted funding programs (Figure 10).
- The relative number of cancer survivors, as measured by the estimated prevalence at 10 years from cancer detection, is another important indicator of burden (Figure 10 inset). For more detail on the research investment in cancer survivorship, please consult our report, *Canada's Investment in Cancer Survivorship Research, 2005-2016*.

FIGURE 9
INVESTMENT BY CANCER SITE, THREE PERIODS (\$M)[1]

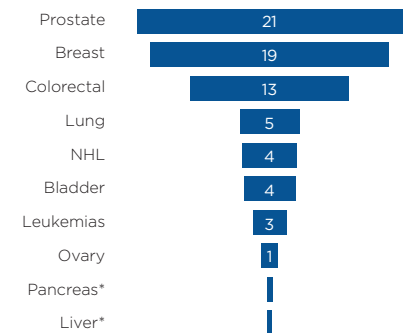


[1] For detailed annual investment by cancer site, please consult the supplementary data file available on the CCRA website.

FIGURE 10
SITE-SPECIFIC INVESTMENT IN 2016 BY FIVE-YEAR NET SURVIVAL AND PROJECTED INCIDENCE FOR 2017 (SELECTED SITES)[1,2]



10-YEAR PREVALENCE ON JANUARY 1, 2009 BY CANCER SITE (SELECTED SITES) (%) [1]

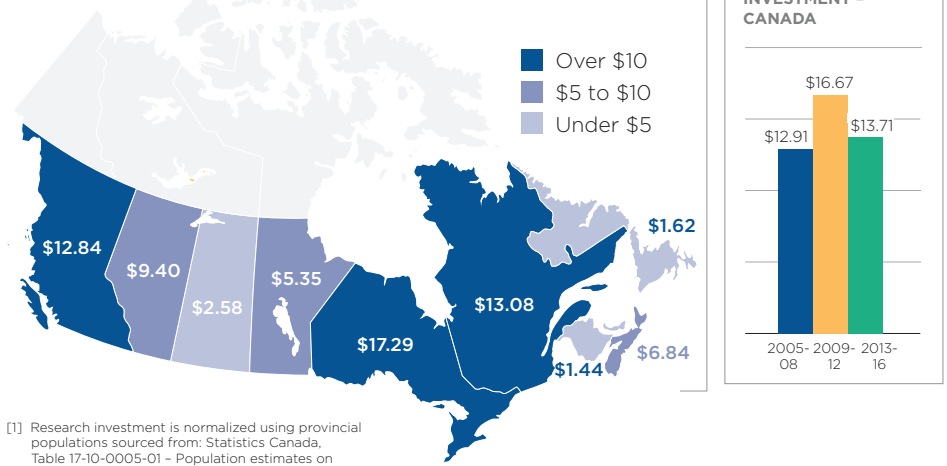


[1] Prevalence data from: Canadian Cancer Statistics, 2016.
* Accounted for less than 1% of cancer survivors.

[1] Source for five-year net survival and projected incidence: Canadian Cancer Statistics, 2017.

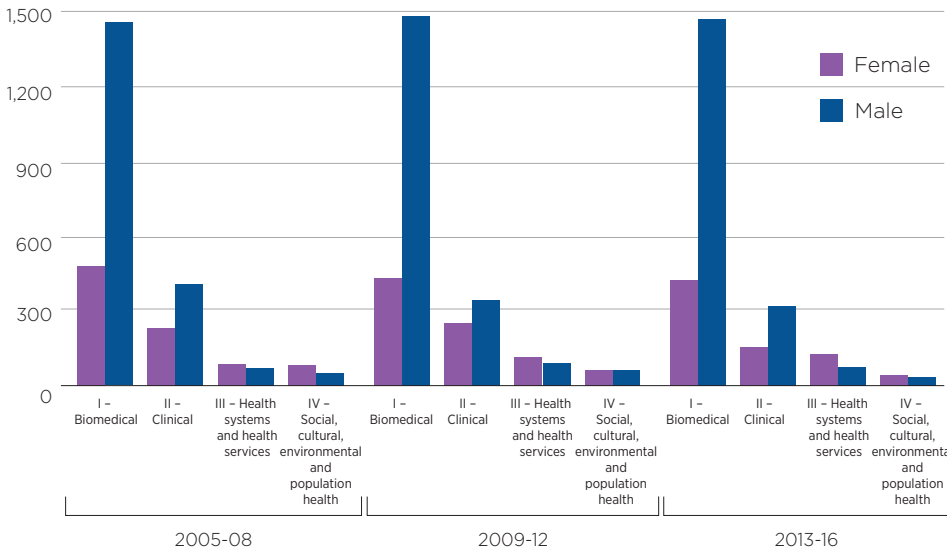
[2] NHL = Non-Hodgkin's Lymphoma

FIGURE 11
PER CAPITA INVESTMENT BY PROVINCE OF NOMINATED PRINCIPAL INVESTIGATOR, 2016[1]



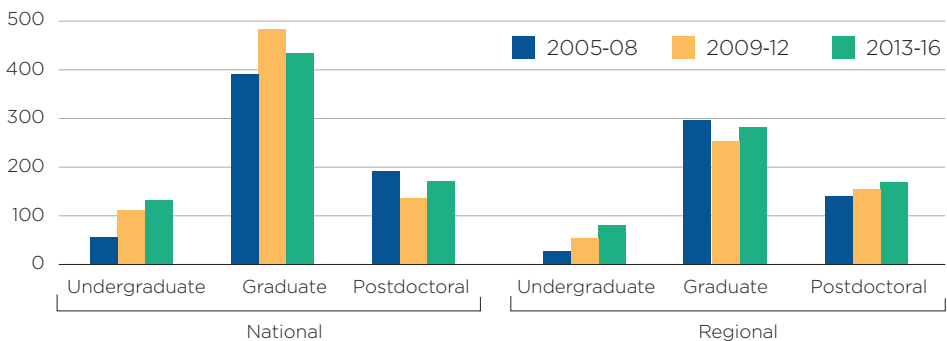
[1] Research investment is normalized using provincial populations sourced from: Statistics Canada, Table 17-10-0005-01 - Population estimates on July 1, 2016 by province.

FIGURE 12
NUMBER OF CANCER-FOCUSED OPERATING GRANTS BY GENDER OF NOMINATED PRINCIPAL INVESTIGATOR, START YEAR PERIODS (N=8,349)[1]



[1] In this graph, time periods are based on the start year of the operating grant.

FIGURE 13
NUMBER OF CANCER-FOCUSED TRAINEE AWARDS BY LEVEL, START YEAR PERIODS (N=5,785)[1]



[1] In this graph, time periods are based on the start year of the trainee award.

- Ontario had the highest per capita cancer research investment in 2016 at \$17.29, followed by Quebec at \$13.08—both exceeded the overall national rate of \$13.04 (Figure 11). As was the case with the overall per capita investments for the country (inset), the provincial per capita investments were highest in the middle four-year period for all provinces. Geography was based on province of the nominated principal investigator (PI), meaning the full investment for each project was assigned to the province of the institution for which the nominated PI was affiliated.

- Over the 12 years, 8,349 cancer-focused operating grants were funded. These spanned the four CIHR pillars of research: I - Biomedical; II - Clinical; III - Health systems and health services; and IV - Social, cultural, environmental and population health. Health services operating grants represented 7% (564) of the total number of operating grants, whereas biomedical operating grants were ten times higher (5,745, 69%).

- Across the three four-year start year periods, there was a preponderance and constant number of operating grants with male PIs in the Biomedical pillar (Figure 12). For each period, more operating grants in the Health services pillar went to female PIs than males. Differences in grant application rates are unknown.

- Although most trainees are supported from diverse sources like provincial or institutional programs, internships or operating grants, a small group of trainees receive awards through the grant peer-review process. There were 5,785 cancer-focused trainee awards given through regional and national programs from 2005 to 2016. While the number of awards was highest in the 2013-16 period, there was variation in the number of awards by trainee level and program reach (Figure 13).

OUR MEMBERS

Alberta Cancer Foundation	Michael Smith Foundation for Health Research
Alberta Innovates	National Research Council Canada
Brain Tumour Foundation of Canada	New Brunswick Cancer Network
Breast Cancer Society of Canada	Nova Scotia Cancer Care Program
BC Cancer Agency	Nova Scotia Health Research Foundation
C ¹⁷ Research Network	Ontario Institute for Cancer Research
Canadian Association of Provincial Cancer Agencies	Ovarian Cancer Canada
Canadian Association of Radiation Oncology	Pancreatic Cancer Canada
Canadian Cancer Society*	PROCURE
Canadian Institutes of Health Research	Prostate Cancer Canada
Canadian Partnership Against Cancer	Public Health Agency of Canada
CancerCare Manitoba	Quebec Breast Cancer Foundation
Cancer Care Ontario	Research Manitoba
Cancer Research Society	Saskatchewan Cancer Agency
Fonds de recherche du Québec – Santé	Saskatchewan Health Research Foundation
Genome Canada	The Terry Fox Research Institute
The Kidney Foundation of Canada	
The Leukemia & Lymphoma Society of Canada	Affiliate member: BioCanRx

*As of February 1, 2017, the Canadian Cancer Society and the Canadian Breast Cancer Foundation merged operations. The data in this report reflects the investments made by these individual organizations prior to this merger.

For details on the methodology used for this report, please consult our report, *Cancer Research Investment in Canada, 2008–2012*, at <http://www.ccra-acrc.ca>. A slide deck, an Excel file with trend data, and an interactive dashboard related to this report as well as research investment reports on specific cancer research topics are also available on our website. For more information or for additional copies of this publication, please contact us at info@ccra-acrc.ca.

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