

Canada's Investment in

Translational Cancer Research, 2005–2016

CANADIAN CANCER RESEARCH SURVEY

Since 2005, CCRA members have prioritized the quantification of Canada's cancer research funding. To that end, the CCRA's Canadian Cancer Research Survey (CCRS) was created, a database that has evolved over time to track the research investments made by over 40 organizations.

The CCRS is estimated to cover about 60–80% of the research investments made in Canada through peer-reviewed processes. Data are updated and corrected annually and will vary from previously published reports. Investment numbers may differ from those reported by contributing organizations because of methodological conventions like budget proration.

THIS REPORT

Cancer exacts a considerable toll. There is increasing emphasis on identifying ways to “translate” research and accelerate the speed at which the public start to benefit from research advances.

This brief report provides an overview of the level and nature of the investment in translational cancer research made by Canadian research funding organizations. Translational cancer research, often referred to as “bench-to-bedside”, bridges fundamental scientific research and clinical research. The ultimate goal of translational research is the application of precision medicine—preventive approaches, diagnostics, monitoring, and treatments that take into account individual variability in genes, environment, and lifestyle.

For the purposes of this report, translational research refers to research that confirms and advances discoveries into tangible modalities (pre-clinical) and tests modalities in the clinic (clinical). Implementation research, which is designed to transfer clinical findings to practice settings and communities, is excluded.

Data were coded to the classification below. Of note, relevant Centres of Excellence for Commercialization and Research (CECR) initiatives through the National Centres of Excellence of Canada were included as Major Initiatives.

Project Classification for Translational Cancer Research¹

Phase	Modality				
	Risk Assessment (RA) Research intended to characterize the cancer-related health status of an individual		Interventive (INT) Research intended to change the cancer-related health status of an individual via prevention or treatment		
Pre-clinical ²	I. Biospecimen-based (biomarkers)	II. Image-based (imaging)	I. Agents (drugs & biologics)	II. Immune Response Modifiers (immunotherapies)	III. Interventive Devices (devices)
Clinical ³					
Major initiative	Centres, networks, and platforms that support risk assessment research – e.g., Ontario Cancer Biomarkers Network, BC Clinical Genomics		Centres, networks, and platforms that support interventive research – e.g., BioCanRx, Canadian Cancer Clinical Trials Network (3CTN)		

¹ Adopted from E.T. Hawk et al. (2009). The Translational Research Working Group Developmental Pathways: Introduction and Overview. *Clinical Cancer Research*, 14(18), 5664–5671.

² Includes all research from post-discovery to pre-clinical, where new modalities are created and tested using model systems.

³ Includes phases I, II, and III clinical trials.

Page 3 of this report presents annual investment data, while page 4 shows the proportion of the investment by key attributes for 2016 (graphs) and for the three four-year periods (tables).

Access interactive visualizations and a related slide deck at www.ccra-acrc.ca.



Investment Trend

From 2005 to 2016, \$2.4B was invested in translational cancer research, of which \$588M was in major initiatives major platforms designed to accelerate research translation primarily through programs of the Canada Foundation of Innovation (CFI) and Networks of Centres of Excellence (NCE). The translational research investment represented 49% of overall cancer research investment in 2016 up from 34% in 2005.



Major Funders

All organizations tracked in the CCRS had some investment in translational research. However, the modality-specific investment was largely from a few funding organizations. In fact, nearly 60% of the overall 12-year investment was accounted for by the Canadian Institutes of Health Research (CIHR), Ontario Institute for Cancer Research (OICR), CFI, Canadian Cancer Society (CCS), and The Terry Fox Research Institute (TFRI).



Investment by Province

A large proportion of the translational research investment went to PIs based in Ontario and Quebec—many major initiatives, which involve large investments, were led by nominated principal investigators (PI) from these two provinces. Geography is based on province of the nominated principal investigator (PI) and does not capture projects that are multi-jurisdictional.



Trainees

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. The investment in trainee awards grew for both national and regional funders at all trainee levels (undergraduate, graduate, and post-doctoral) over the three time periods, although there were some modality-specific variations. 1,636 trainees received awards for translational research projects over the 12 years.



Investment by Modality

For all modalities, there were significant increases in the investment from 2005 levels, although they each had unique patterns in terms of peak investments. Across the board, much of the increased investment was in the pre-clinical phase. The investment in clinical research also grew for all modalities and was highest in the 2013-16 period. The largest investment in terms of major initiatives was for interventional modalities, with much of this investment focused on research on agents and immune response modifiers.



Investment by Cancer Site

Breast cancer research represented nearly one-quarter of the total site-specific investment over the 12-year period. The average annual site-specific early translational cancer research investment exceeded \$5M per year for each of the following six cancer groups: breast, prostate, leukemia, brain, lung, and colorectal. The largest increased site-specific investments from 2005-08 to 2013-16 were found for research on leukemias, prostate, breast, brain, and pancreatic cancers, non-Hodgkin's lymphoma, and ovarian cancer.



Researchers

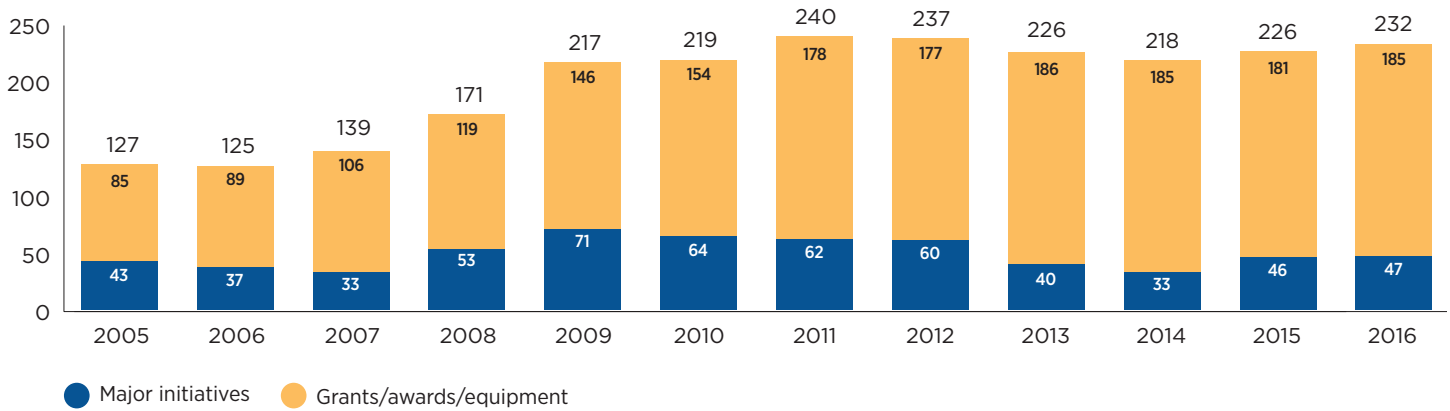
There were 1,011 PIs with at least one or more operating grant, career award, or equipment grant with a translational research weighting of 100% with funding in the 2013-16 period. Half of these researchers were funded for interventional research, 24% for risk assessment research and the remainder with research in both areas.



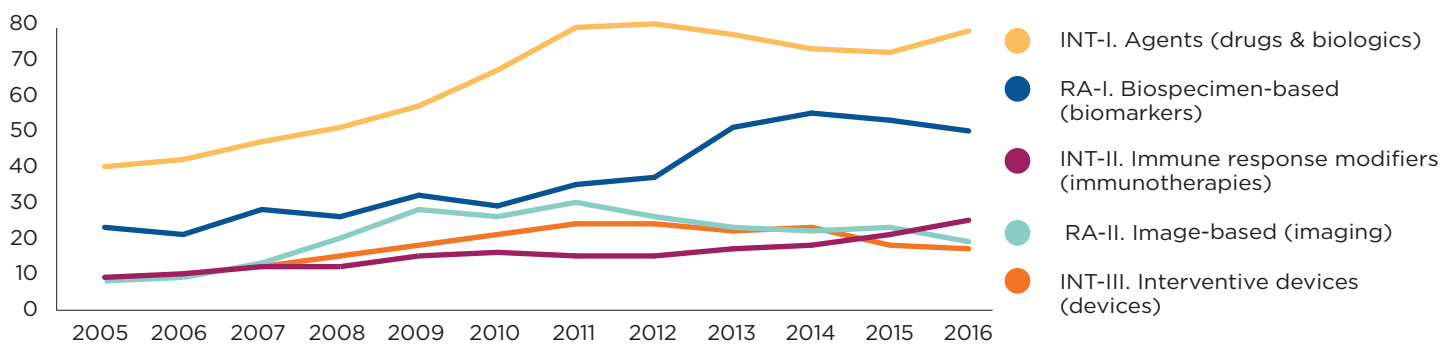
Biorepositories

Biorepositories were not included in the investment figures but are critical to ensuring quality translational research. Over the 12 years, many funders invested in the establishment of biorepositories - both national and regional - as well as standard-setting networks such as the Canadian Tissue Repository Network (CTRNet).

Annual Investment (\$M)



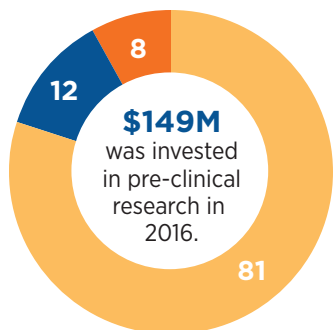
Investment by Modality (\$M)



Investment by Funder (\$M)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CIHR	23	26	27	33	35	39	45	47	46	45	48	54
OICR	11	10	14	20	35	29	33	31	26	25	28	33
CCS	12	13	13	13	13	13	12	12	15	18	21	19
Natural Sciences and Engineering Research Council	3	3	4	8	11	13	14	14	13	13	15	16
TFRI	6	6	7	8	10	12	12	13	13	12	11	11
CFI	17	13	12	18	23	21	20	18	11	7	10	8
Alberta Cancer Foundation	1	2	3	6	5	5	5	6	7	8	6	8
Canadian Breast Cancer Foundation	2	3	3	3	4	4	5	7	8	8	7	7
Ontario Ministry of Economic Development, Job Creation and Trade	5	5	6	7	10	11	13	11	8	6	6	7
Genome Canada	6	4	3	0	0	3	6	7	7	5	5	7
Canada Research Chairs Program	4	4	5	5	5	5	5	5	5	6	5	5
Alberta Innovates	2	3	4	5	5	4	5	5	6	8	7	5
Other funders	37	33	37	44	58	57	63	63	59	57	59	53

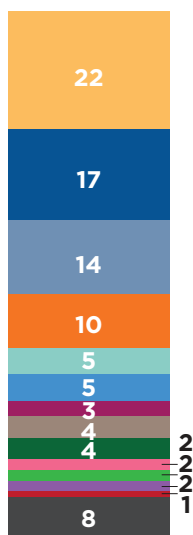
Modality Phase (%)



	2013-16	2009-12	2005-08
Credentialing/creation/pre-clinical	81	75	73
Clinical (Phases I-III)	11	11	10
Equipment/infrastructure/related support	8	14	17

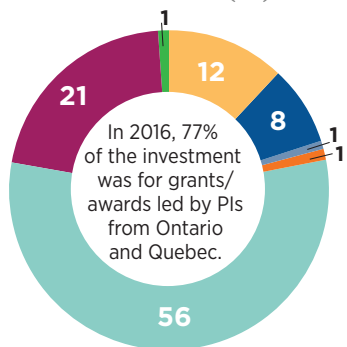
Modality-specific Site Investment (%)

\$30M of the 2016 investment was focused on breast cancer.



	2013-16	2009-12	2005-08
Breast	22	27	26
Prostate	19	17	13
Leukemia	13	11	9
Brain	9	7	6
Lung	5	9	9
Colorectal	5	6	10
Ovary	4	4	4
Non-Hodgkin lymphoma	4	2	3
Pancreas	3	1	1
Multiple myeloma	2	1	3
Skin (melanoma)	2	2	3
Oral	2	2	2
Cervix	1	2	3
Other sites	8	8	8

Investment by Province of PI (%)



	2013-16	2009-12	2005-08
British Columbia	12	11	17
Alberta	9	7	10
Saskatchewan	1	1	2
Manitoba	2	1	1
Ontario	54	65	53
Quebec	20	13	16
Atlantic Provinces	2	1	2