PHSA RESEARCH METRICS REPORT

8th Annual Report

Fiscal Year 2015–16

Prepared For:

PHSA Research Committee

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ACKNOWLEDGEMENT

The following report is prepared for the Provincial Health Services Authority (PHSA) Board of Directors on an annual basis to present data related to the Framework for PHSA Research Metrics (see Appendix 2). As an academic health sciences organization, PHSA works in close partnership with the University of British Columbia and other academic partners, including Simon Fraser University, University of Victoria, and University of Northern BC.

The research activities described in this report are made possible only through the collaboration and partnership of PHSA, its agencies and research entities, and its academic partners.

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CHILD & FAMILY RESEARCH INSTITUTE

BC MENTAL HEALTH & SUBSTANCE USE SERVICES
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BC Centre for Disease Control
An agency of the Provincial Health Services Authority

WOMEN'S HEALTH RESEARCH INSTITUTE AT BC WOMEN'S

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PHSA RESEARCH METRICS FISCAL YEAR SUMMARY: PHSA OVERALL

Indicator		Key Measure Description	FY 2013–14	FY 2014–15	FY 2015–16
			Value	Value	Value
Producing & Advancing Knowledge	1a	**Total Annual Grant Awards by Type** (excluding Major* CFI Infrastructure grants for 13/14 only)	**$141,001,291**	**$131,838,156**	**$159,747,871**
		Salary Awards	10,887,936	12,751,039	13,306,431
		Infrastructure Awards*	2,755,351	16,675,937	45,471,139
		Operating Grants	121,878,768	98,107,211	97,099,541
		Other	5,479,236	4,303,969	3,870,760
		Total Annual Grant Awards including Major CFI Infrastructure grants	**142,381,426**	**131,838,156**	**159,747,871**
	1b	**Total Annual Grant Awards by RISe Sector** (excluding Major* CFI infrastructure grants for FY 13/14 only)			
		Government	66,101,747	67,395,627	92,657,320
		Non-Profit	62,575,175	48,906,960	55,124,321
		Industry	12,324,370	15,535,569	11,966,230
	1c	Annual Grant Application Success Rate—CIHR March Competition: PHSA Overall/ Nat'l Rate	31.3%/20.1%	21.3%/17.7%	19.7%/18.6%
	1c	Annual Grant Application Success Rate—CIHR Sept Competition: PHSA Overall/ Nat'l Rate	22.2%/19.0%	N/A	N/A
	1d	Total # of Publications with Agency Author			
		CFRI	694	679	738
		BCCA	826	524	341
		WHRI	300	328	412
		BCCDC	190	227	228
		BCMHSUS	70	83	95

Indicator		Key Measure Description	FY 2013–14	FY 2014–15	FY 2015–16
			Value	Value	Value
Building Research Capacity	2a	Total # of Research Trainees	1,279	1,232	1,293
	2c	Total # of Researchers (excluding Category 4—Affiliate Investigator Category)	696.5	724.5	769.5
		Category 4—Affiliate Investigator	39	40	41
	2d	Infrastructure Investment			
		Major CFI Infrastructure Grants	$1,380,135	See Note Below	See Note Below
	2e	Indirect Costs Program Grants (Tri-Council only)	$3,793,358	$4,057,550	$4,010,692
Achieving Economic Benefits & Innovation (BCCA, CFRI & BCCDC only)	3a	# of Invention disclosures	52	60	52
		# of Provisional Patent applications filed	22	29	25
		# of PCT applications filed	5	7	6
		# of Patents Filed/Issued	23/6	41/9	25/28
	3b	# Active License Agreements	146	159	163
		# of Spin-off Companies	10	9	10
		IP related revenue—Realized Revenue			
		BCCA	$93,506.53	$174,696.69	$274,585.00
		CFRI	$55,375.00	$28,758.00	$41,295.44
Advancing Health & Policy Benefits	4a	**Clinical Trials** (including Non-PHSA PIs utilizing PHSA facilities and resources)			
		# active trials at the end of the FY	529	551	519
		Cumulative Subject Enrollment at end of FY	32,511	63,146	58,450
	4b,c,d	**Registries as Research Resources**			
		# of Research Requests/Approvals	196/110	216/204	189/180

*see definition of Major CFI grants in Glossary – Appendix 4; applies to FY 13/14 only

Note: As of 2014/15, Major CFI awards are included in total annual grant awards and can no longer be separated out due to changes in source data.

EXECUTIVE SUMMARY

This is the eighth annual Research Metrics Report, based on the Framework for PHSA Research Metrics previously approved by the PHSA Research Committee (see Appendix 2, pg. 85). All previously reported qualitative and quantitative metrics have been updated to include data for FY 2015–16 in the Framework's four categories; Producing & Advancing Knowledge, Building Research Capacity, Achieving Economic Benefits & Innovation, and Advancing Health & Policy Benefits.

The results for each metric are provided in a two-page snapshot utilizing combined information from each participating PHSA research entity. These include Child & Family Research Institute (CFRI), British Columbia Cancer Agency (BCCA), Women's Health Research Institute (WHRI), BC Mental Health and Substance Use Services (BCMHSUS) and British Columbia Centre for Disease Control/UBC Centre for Disease Control (BCCDC/UBC CDC). The May 2016 rebranding of CFRI, that underscores the close connection to BC Children's Hospital will be reflected with a new name in next year's report. While there are a number of researchers associated with the BC Emergency Health Services (BCEHS), BC Renal Agency, Cardiac Services BC, and BC Transplant, they conduct their research under the auspices of the academic affiliation they hold. As such, research activities are not attributed directly to these PHSA agencies and they are accordingly not captured in this report with the exception of information related to their associated data registries.

As seen on the PHSA Overall Summary Table, total annual grant awards ($159,747,871) increased 21% over last year's numbers. The majority of this increase is due to two large infrastructure grants from Canada Foundation for Innovation and BC Knowledge Development Fund: 1) A $31 million award for a BCCA researcher at the Genome Sciences Center and 2) a $6.5 million award for a CFRI researcher for diabetes research. Total annual grant awards, excluding these large infrastructure awards, have remained relatively stable since FY 2010–11. The numbers of researchers, researcher trainees, publications, number of patents issued, and registry access metrics have all increased from FY 2014–15 levels.

The total amount of the Indirect Costs Program (ICP) grant for FY 2015–16 for all PHSA agencies combined was $4,010,692. This amount is not reported as part of total research funding in this report but is included here as UBC reports this figure to align with the CAUBO (Canadian Association of University Business Officers) policies.

CIHR phased out the Open Operating Program (OOP) and replaced it with the Foundation and Project Scheme competitions in the Fall of 2014. During this change, there was one Transitional Open Operating Grant Program (TOOGP) competition in March of 2015. Results from the TOOGP can be compared to national averages as in previous years reporting. Results are also provided for the inaugural Foundation Pilot Scheme #1 for all of Canada, UBC and PHSA. However, the Foundation Pilots were not open competitions and thus reflect success rates within each agency and are not compared to a national average. After receiving feedback from the research community, CIHR struck a Peer Review Working Group in August of 2016 to address serious concerns with the peer review process in both the Foundation and Project Schemes. As announced on August 30, 2016, the Foundation Grant funding opportunity will proceed with no significant changes to the process. The next Project Grant funding opportunity was also announced and will incorporate the recommended changes to both the application and peer review process, as per the Working Group.

For a second year, PHSA utilized SciVal for collecting and reporting publications, a widely used measure of the impact of research. Through an affiliation with UBC, agencies were able to utilize SciVal, a web-based bibliometric tracking tool. Progress has been made, at both the institute and academic level, to require researchers to obtain an ORCID ID (Open Researcher & Contribution ID) a persistent digital identifier and an international standard. This identifier will alleviate the ambiguity problem in scholarly output data collection and result in more accurate statistics. The total number of publications reported for FY 2015–16 represents the agency total for publications where agency researchers were authors of the study. When researchers from more than one research entity/agency collaborate on one publication, it is counted once for each agency. Hence, an aggregate total PHSA number is not available.

Reporting related to Indicator 3: Achieving Economic Benefits and Innovation captured numbers of intellectual property (IP) disclosures and patents at the BC Cancer Agency, and CFRI. Data across PHSA agencies remained relatively stable. Of note this year is the large increase in issued patents. These include four issued patents relating to the Prosigna breast cancer test licensed to nanoString Technologies and 13 issued patents relating to the Essa pharmaceuticals spinoff/start up company which is developing new drugs for the treatment of prostate cancer. Once technologies are licensed, the partner typically funds patent filings in multiple countries. This is especially true for new pharmaceuticals.

For Indicator 4: Advancing Health and Policy Benefits data was collected utilizing an online survey asking respondents to identify any guideline, drug, diagnostic agent or device adopted or approved in FY 2015–16 as a result of research driven by PHSA researchers, or collaborative research in which PHSA researchers were key participants, as well as the benefits resulting from those initiatives. For a third year, benefits were classified into two categories (Patient or System Benefit) to more fully summarize the responses. The majority of benefits submitted fell into the Patient type. The top three sub-types included Protocols and guidelines (30), Access to new treatment/technology (22), and Delay of disease/survival (15). The top System benefit was Knowledge dissemination/New policy. The type of benefit can be found in the third column of the table after each agency section. A key finding for each agency is presented in summary form in the PHSA overall section, with detailed submissions included in the respective agency sections. While not intended to be an exhaustive listing, this year's submissions highlight some of the key products resulting from PHSA research that are improving outcomes and system sustainability.

For a third year, all PHSA registries participated in the Registries as Research Resources survey. Of note this year is the inclusion of the BC Children's Biobank for the first time. PHSA also has the Tumor Tissue Repository biobank located at the Vancouver Island Centre of the BC Cancer Agency. Under the auspices of Health Research Council of BC, a campaign will launch in the fall to achieve the mandatory registration of all BC biobanks—a first step towards improving the reliability and quality of biospecimens at a provincial level. (The BC Children's Biobank and the Tumor Tissue Repository biobank are already registered.) As biobanks represent a significant infrastructure supporting research, additional metrics related to specimen collection and access will be considered for future reporting.

Clinical trial data is reported using data from the Research Ethics Board (REB) data set and includes principal investigators (PIs) who utilize PHSA facilities and resources but are not formally affiliated with a PHSA research institute and PHSA PIs who utilize a non-PHSA ethics board (ie. UBC's Clinical Research Ethics Board and Behavioral Research Ethics Board). Results remained relatively stable over last year's report. Clinical trial data is pulled from the REB application and while data availability has improved, 25% of CTs have no enrollment data as this field is not yet mandatory.

The new PHSA Research Administration & Services website was officially launched in FY 2015–16. This external website was developed to provide a central place where PHSA research policies, process, and support services are available and accessible to PHSA research and health authority networks. The site focuses on PHSA related items and links to site-specific websites. This is the first step in providing better communications and support for the research community.

Although the data presented in this report provide trending and, in some instances, comparative information, efforts

have been made to portray each reporting entity uniquely, to accurately reflect their very different and unique natures. Presented together, they portray the range and depth of research activity associated with PHSA. The unique natures of the research entities result in some variability in the availability and detail of some metrics.

To better understand the metrics reported, it is helpful to refer to the glossary and definitions document (see Appendix 4, pg. 87) that guided data collection.

The following report was prepared with the assistance of the Research Metrics working group comprising representatives of each of the PHSA research entities and PHSA Performance Measurement and Reporting (see Appendix 3, pg. 86). The individuals within this group worked extremely hard to develop consistent definitions and approaches to collecting data which has further strengthened the consistency and clarity of the collected metrics and their efforts are greatly appreciated. The ability to report on all metrics included in the PHSA's research metrics framework is an iterative process and metrics will continue to be refined further in future reports.

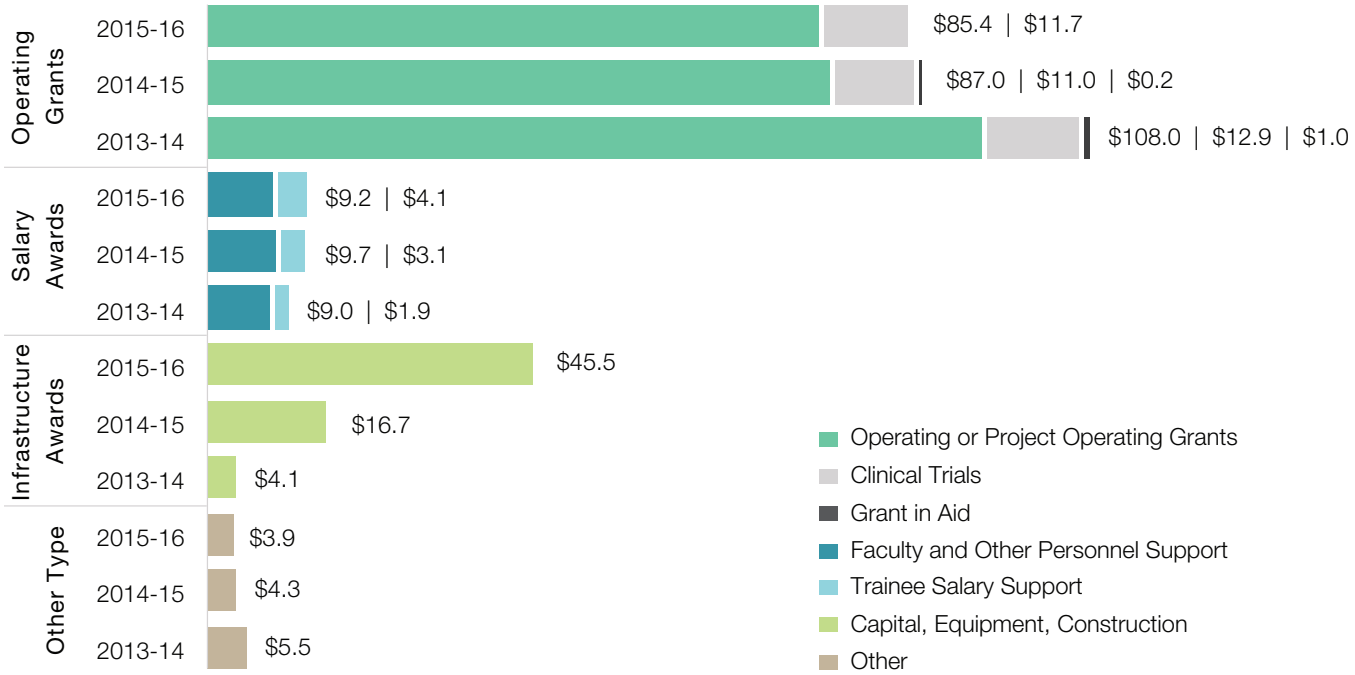
PHSA AGGREGATE ANALYSIS

Producing and Advancing Knowledge

In FY 2015–16, researchers affiliated with PHSA were awarded a total of $159,747,871, a 21% increase in total awards from FY 2014–15. Operating Grants ($97,099,541) continued to make up the largest portion (61%) of total funding received. Operating grants support specific, time-limited research projects. While operating grants are the "bread and butter" of research grants, salary awards are important to provide researchers with the protected time to successfully compete for operating grants and represent approximately 9% of total awards for the past three fiscal years.

A breakdown of funding types and subtypes by fiscal year can be found in Figure 1. For FY 2015–16, the subtypes of Operating or Project Operating Grants, and Infrastructure Awards garnered the largest portion of research funding in their respective type categories. Clinical Trials funding remained relatively stable. Infrastructure awards saw a large increase in FY 2015–16 due to two large Canada Foundation for Innovation and BC Knowledge Development Fund grants. A $31.7 million grant was awarded to a BCCA Genome Sciences Center investigator and a $6.4 million grant was awarded to a CFRI investigator for a childhood diabetes lab.

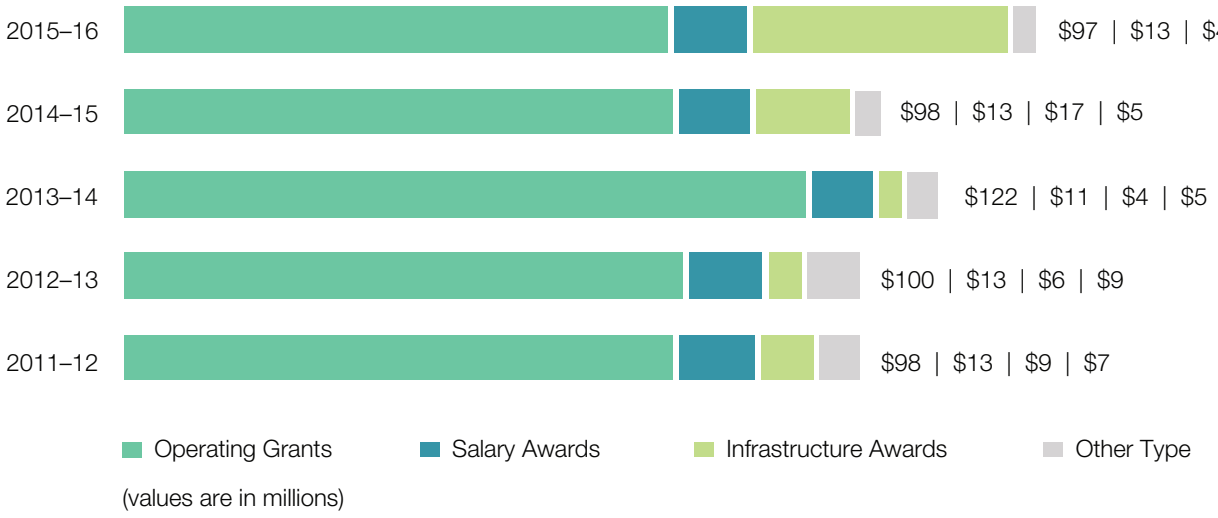
FIGURE 1 **Total PHSA Research Funding by Funding Type and Sub-Type by Fiscal Year**



(values are in millions)

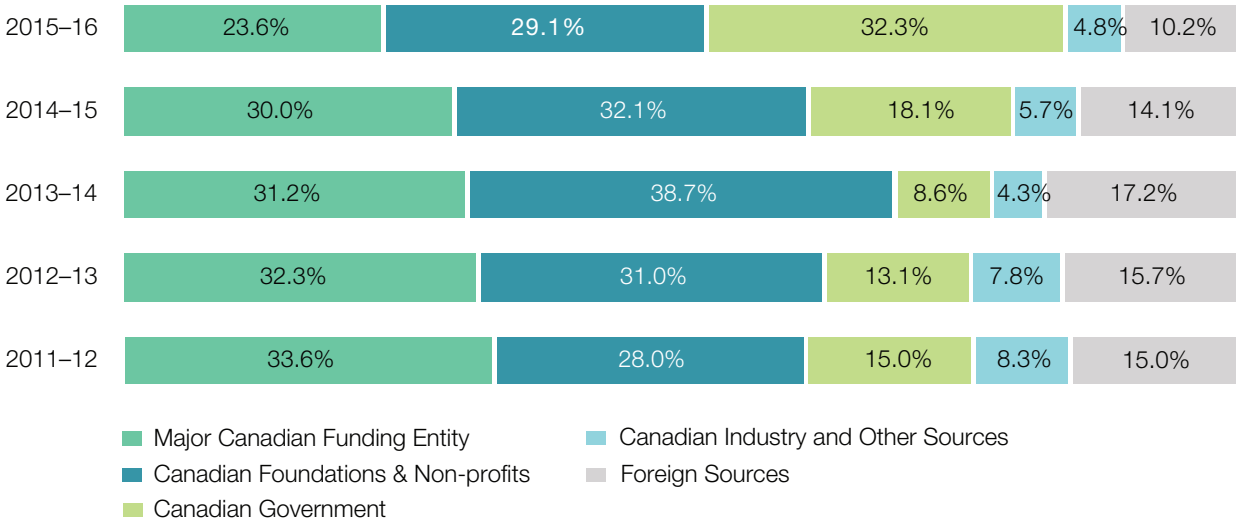
Indirect Costs Program grants total $4,010,692, and represent funding to support the indirect costs of research for tri-council awards, but is not included in total research funding or the figures below. Due to the fact that research support is a shared expense between UBC and PHSA research agencies, PHSA has negotiated to receive 66% of the applicable UBC ICP grant. Figure 2 shows Total Research Funding by Fiscal Year and Type for the past five fiscal years. Of note is the large increase in infrastructure awards as detailed above.

FIGURE 2 Total PHSA Research Funding by Fiscal Year and Type



A comparison of funding source by source category over five fiscal years can be found in Figure 3. This figure, generated by compiling hundreds of potential sources into five categories, highlights the extent to which primary sources of funding vary from year to year. While the notable increase in Canadian Government funding (light green) reflects the large CFI grant attracted by one PHSA researcher, this comparison is monitored year to year for high level trends. Of note is the continued downward trend in funding from Major Canadian Funding entities (includes CIHR, NSERC, SSHRC, MSFHR and Genome Canada & Provincial Agencies) which reflects a 10-point drop in funding over five years. In addition, Canadian industry continues to decline in funding support.

FIGURE 3 Percentage of PHSA Research Funding by Funding Source Category by Fiscal Year



In addition to this comparison, Figures 4 and 5 show the same award data by RISe sector (see glossary, pg. 90, for sector definition) both by fiscal year and by agency for five fiscal years. Of note on the FY chart, is the reverse in the downward trend of awards by Government (green). Also of note is the corresponding decrease in Non-profit (blue), one of the largest funding sectors for all PHSA agencies.

Figure 5 shows the percentage of funding by RISe sector and agency for FY 2015–16. This graph reflects the variations in funding sources for all of PHSA research entities, as BCMHSUS, BCCDC and WHRI rely heavily on government funding.

FIGURE 4 Percentage of PHSA Research Funding by RISe Sector and Fiscal Year

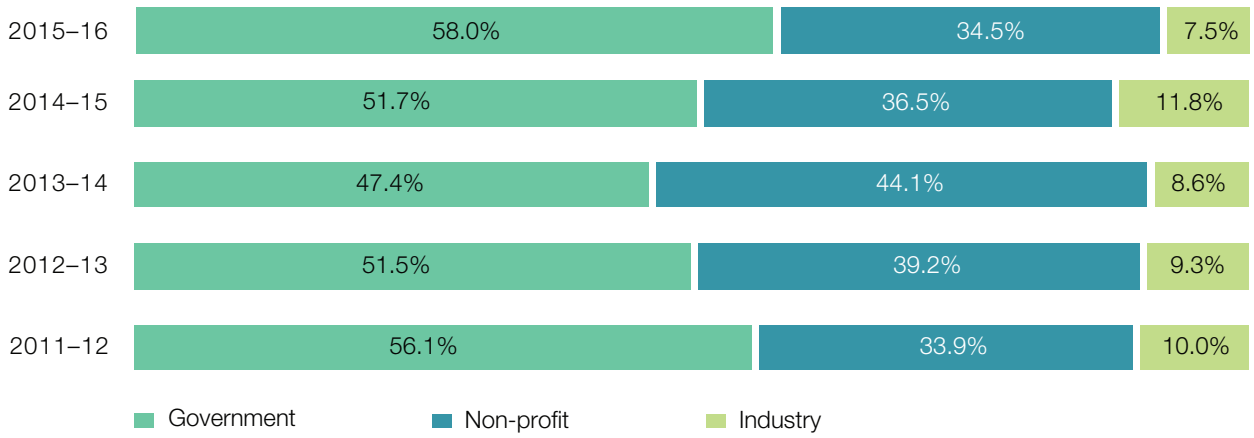
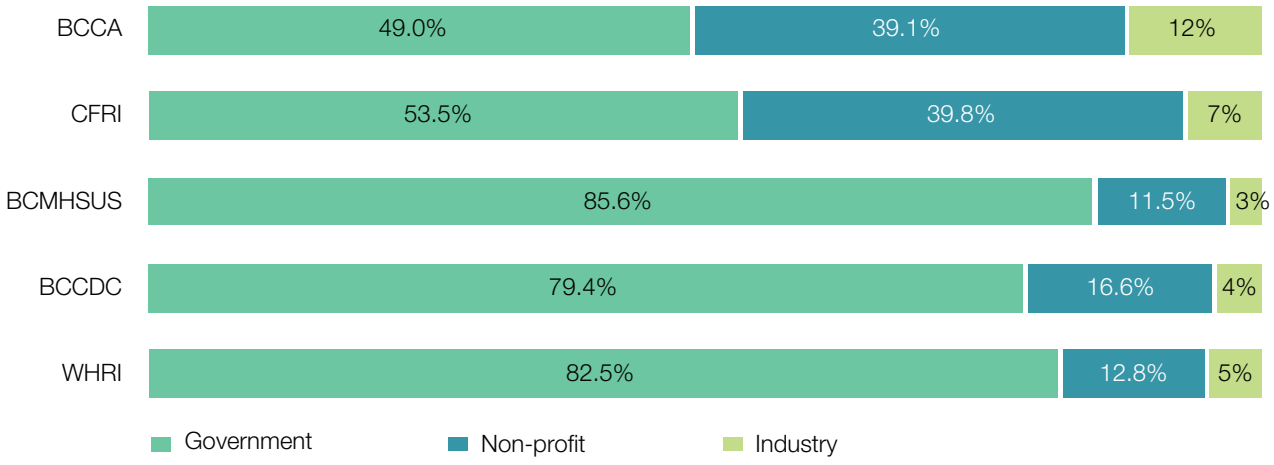


FIGURE 5 Percentage of PHSA Research Funding by RISe Sector and Agency

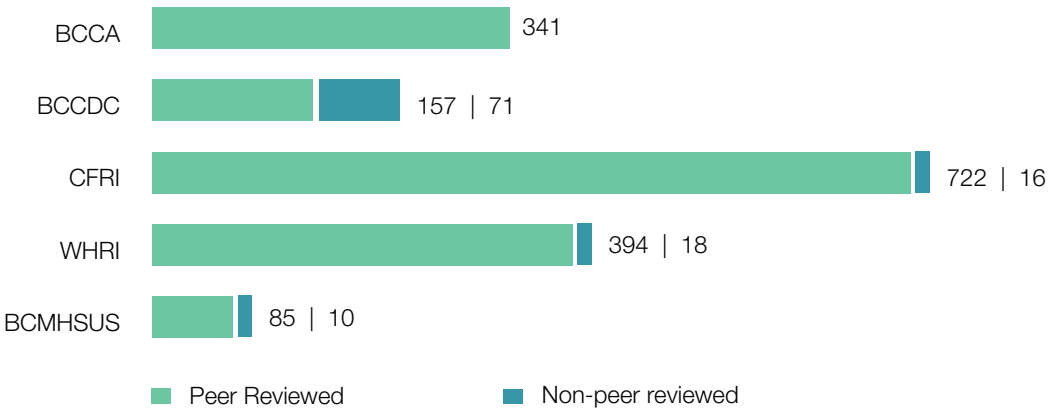


Due to the fact that CIHR has adopted a new funding scheme as of 2014, the application success rate is reported for two separate competitions for FY 2015–16: 1) A March 2015 Transitional Open Operating Grant Program competition (TOOGP) that is the last OOGP before full implementation of the new Open Suite of Programs; and 2) The first Foundation Scheme "live pilot" competition, outcomes for both announced in July 2015. PHSA exceeded the national average for the TOOGP and received nine Foundation Scheme grants in Pilot #1. A success rate for the Foundation Scheme pilot cannot be calculated as it was not an open competition and is limited to investigators whose grants expired at specific times. The success rates of the TOOGP are based on revised competition results which include bridge and priority funding.

Grant Funding Opportunity	National Overall Results % (Approved/Submitted)	UBC Results % (Approved/Submitted)	PHSA Results % (Approved/Submitted)
TOOGP—March 2015	18.6% (500/2682)	13.6% (35/258)	19.7%% (13/66)
Foundation Scheme Pilot #1	23% (150) approved from stage 2–3	23 approved	9 approved

As indicated in the executive summary, statistics for publications were collected utilizing SciVal with Scopus as the source. Publications were collected in the categories of books, book chapters, peer-reviewed publications inclusive of published journal articles, case reports, essays, literature reviews, and reports produced for government. See Figure 6 for a breakdown of total publications by agency and category. Totals are reported by calendar year for WHRI, BCCA, CFRI, and BCMHSUS and by fiscal year for BCCDC. A breakdown by types is shown in the agency specific sections due to low sample size.

FIGURE 6 Total Number of Publications by Agency and Category



Building Research Capacity

PHSA research entities identified 769.5 researchers in categories 1, 2, 3 and 5 in FY 2015–16, up 45 from FY 2014–15 (see Figure 7). Category 4 researchers are defined as Affiliate Investigators and represent those researchers with a primary affiliation with a research or academic institution external to PHSA, but who wish to remain collaborators with PHSA researchers. Category 4 researchers totaled 41, up one from FY 2014–15. PHSA does not track category 4 members funding, publications or trainees. BCCA, BCMHSUS and CFRI are able to report their researchers utilizing CFRI definitional categories, which highlight the amount of time protected for research purposes. BCCDC and WHRI define researchers utilizing a methodology that best reflects the type of work and relationships they have with their researchers. Further information on these methods can be found in specific agency sections. An attempt to count each researcher only once was made by attributing each researcher to the entity where the bulk of salary and/or support are received. Category 1 researchers are best positioned to compete for external grants.

FIGURE 7 Total Number of PHSA Researchers by Category and FY

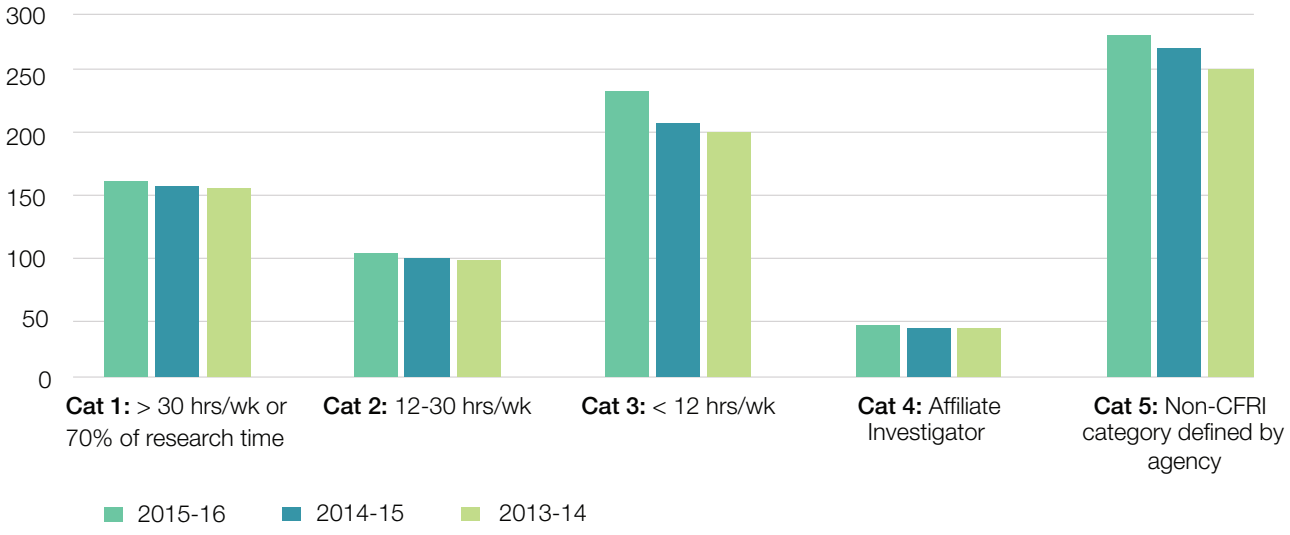


Table 1 provides summary statistics by agency at the Principal Investigator (PI) level. PHSA received funding for 376 Principal Investigators collaborating with 1,130 UBC co–investigators for 1,311 unique studies in FY 2015–16. This excludes Salary and Other award types as these are not designated for specific studies and the number of co–investigators from other academic institutions.

TABLE 1 Number of Funded Studies, PI's, UBC Co-PI's and Award Amount by Agency

Agency	# of Unique Studies	# of Unique PI's by Agency	# of UBC Co-PIs by Agency	Total Award Amount
BCCA	628	164	545	94,373,181
BCCDC	36	21	53	2,376,395
BCMHSUS	29	12	17	2,055,457
CFRI	584	167	440	41,052,055
WHRI	34	12	75	2,774,156
Grand Total	**1,311**	**376**	**1,130**	**142,570,680**

During FY 2015–16, PHSA researchers provided training and supervision to a total of 1,293 research trainees, an increase of 61 from FY 2014–15. This is a significant metric because the training of Post-doctoral fellows (PDFs), Doctoral, and Masters Trainees in particular is a major indicator of the degree to which PHSA and its research entities are supporting their academic mandate and ensuring the next generation of highly qualified research personnel. In addition, Post-doctoral fellows and Doctorals contribute significantly to the conduct of research under the supervision of principal investigators. See Figure 8 and 9 for the number of trainees by type and fiscal year for PHSA overall.

FIGURE 8 Total Number of PHSA Trainees by Fiscal Year

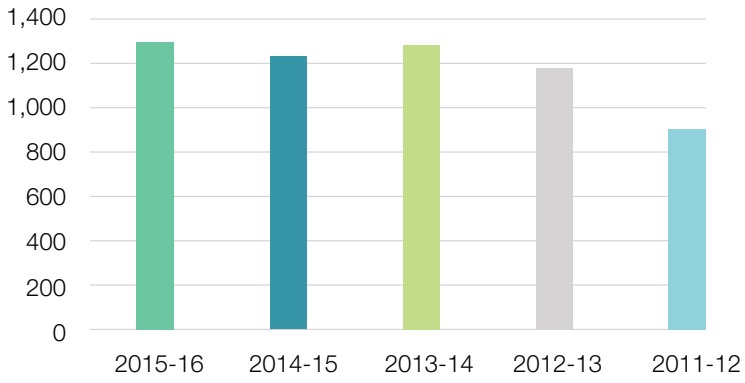
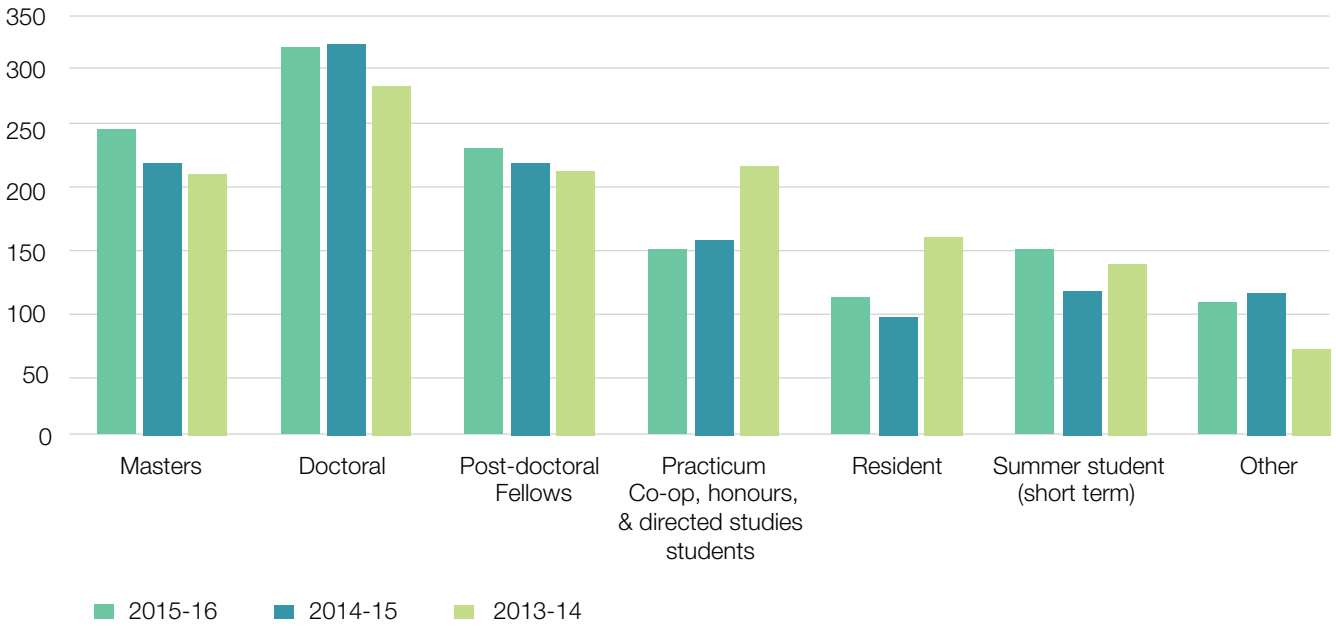


FIGURE 9 Total Number of PHSA Trainees by Type by Fiscal Year

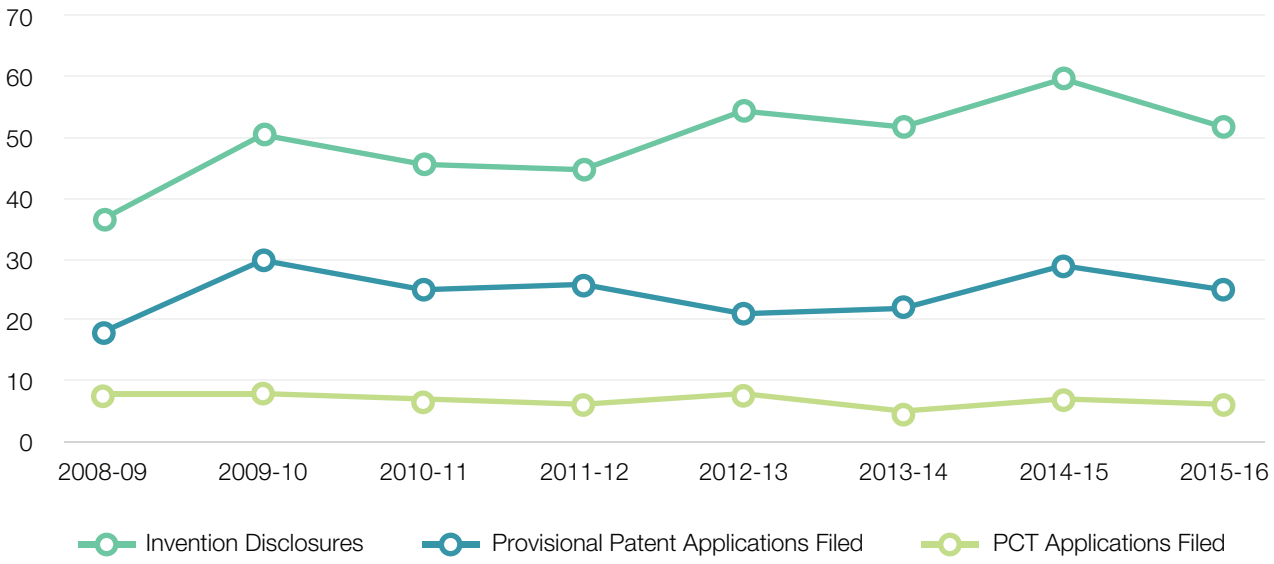


Achieving Economic Benefits and Innovation

The patent process, along with data on licensing and spin-off companies, is provided to measure the commercialization of discoveries, and other economic benefits resulting from these discoveries. Data are included for BCCA (through the TDO), and CFRI (through UILO). Agency specific IP related revenue data is provided in agency sections.

See Figure 10 for total number of invention disclosure, provisional patent and patent cooperative treaties (PCT) applications filed by fiscal year. Invention disclosures are primarily internal documents, filed to inform the decision of whether or not to proceed with the patent process. The next stage in the patent process is to file provisional patent applications followed by patent cooperative treaties, or PCTs, which act as a gateway to world-wide patents, each step involving greater specificity.

FIGURE 10 **Total # of Invention Disclosures, Provisional Patent and PCT Applications Filed by Fiscal Year**



See Figure 11 for the number of national provisional patent applications filed and issued. Applications filed in a given year represent different applications than those which are approved in that same year.

Figure 12 shows all licensing agreements and spin-off companies for both BCCA and CFRI combined for the past eight years. Agency specific numbers can be found in the agency section. The BCCA spin-off, Logipath Medical was reactivated this year.

FIGURE 11 Total # of National Provisional Patent Applications Filed and Issued by Fiscal Year

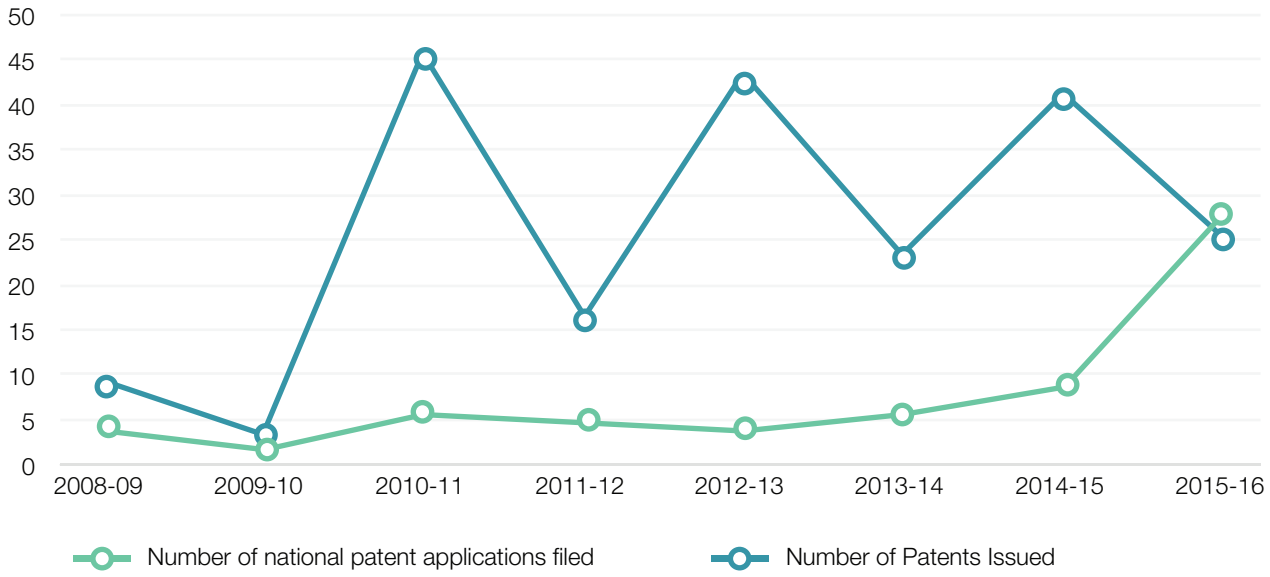
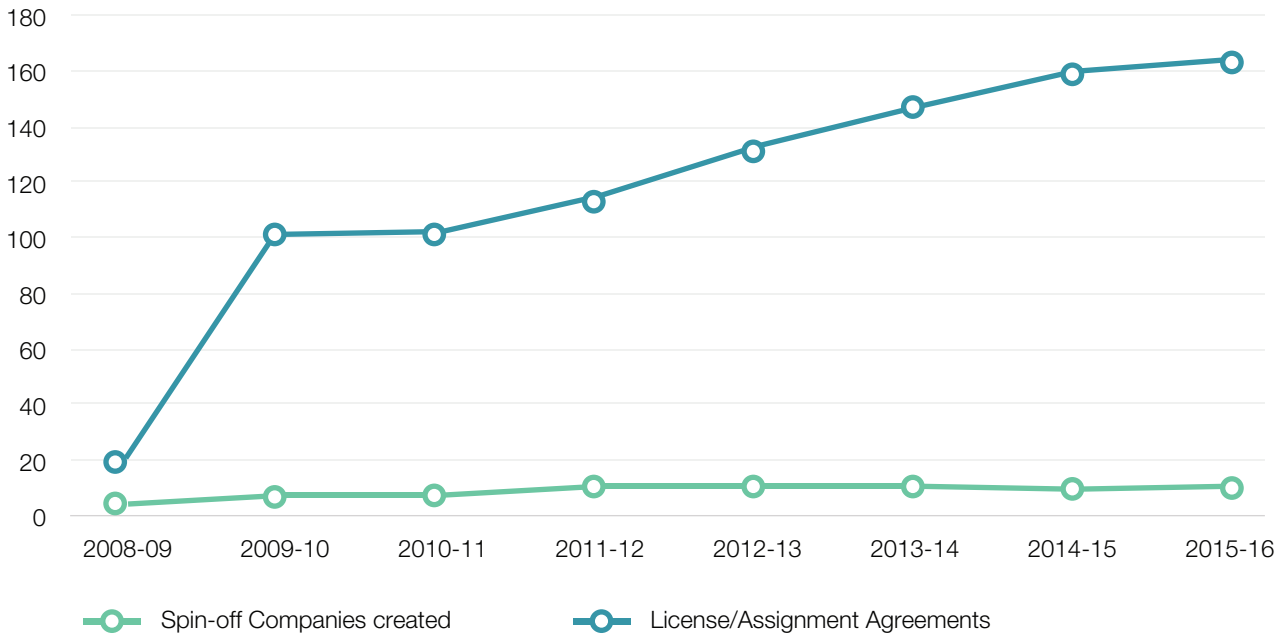


FIGURE 12 License/Assignment Agreements and Spin-Off Companies by Fiscal Year

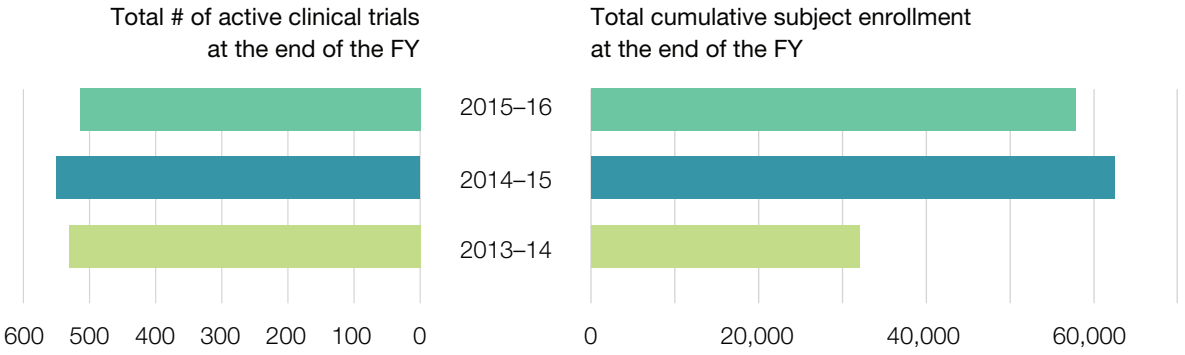


Advancing Health and Policy Benefits

For FY 2015–16, the number of clinical trials decreased by 32 to 519, with enrollment staying relatively stable. Fluctuations in number of studies and enrollment are wholly dependent on the quality of the data source for accuracy and should not be interpreted as a decline. Data quality is improving with only 25% of records missing enrollment data in the REB application, in FY 2015–16. Another factor in the decline is attributed to a better understanding of CT's being done at PHSA facilities by unaffiliated investigators. See Figure 13 for number of Clinical Trials and Total Cumulative Subject Enrollment by Fiscal Year.

The opportunity to participate in clinical trials is an important metric because it offers patients the opportunity to participate in clinical evaluation of new drugs, many of which achieve therapeutic benefits beyond those offered by standard of care treatment. Clinical trials also represent the final step in the translational research continuum, which begins with basic or discovery research, includes development of particular products, and culminates with the testing of those products in rigorous trials.

FIGURE 13 **Total # of Clinical Trials and Total Cumulative Subject Enrollment by Fiscal Year**



In FY 2015–16, the agencies completed the survey that asked respondents to identify guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2015–16 as a result of research driven by PHSA researchers or collaborative research in which PHSA researchers were key participants. The survey was not intended to be exhaustive, but to capture the significant, top of mind advancements, and, further, asked respondents to identify the benefits to patients, population health, and/or health system sustainability of those advancements.

Respondents were asked to classify the stated benefits into categories to more fully summarize the responses. These categories are shown in the third column of data in Table 2 and mirror the benefit categories utilized in the Registry Survey. Figure 14 is a summary of the classification of benefits realized through research at the agencies and with data from the registries, combined. These represent the top choice of category as many benefits were classified into more than one category (see agency sections for details). System benefits were most often chosen as a secondary benefit. The other type category includes improvement of safety, improved diagnosis/treatment, and directional research.

In addition, Table 2 lists a key achievement for each agency with full details provided in each agency/reporting entity section and documents important achievements in translational research.

FIGURE 14 Classification of Benefits Summary for FY 2015-16 for All Agencies & Registries

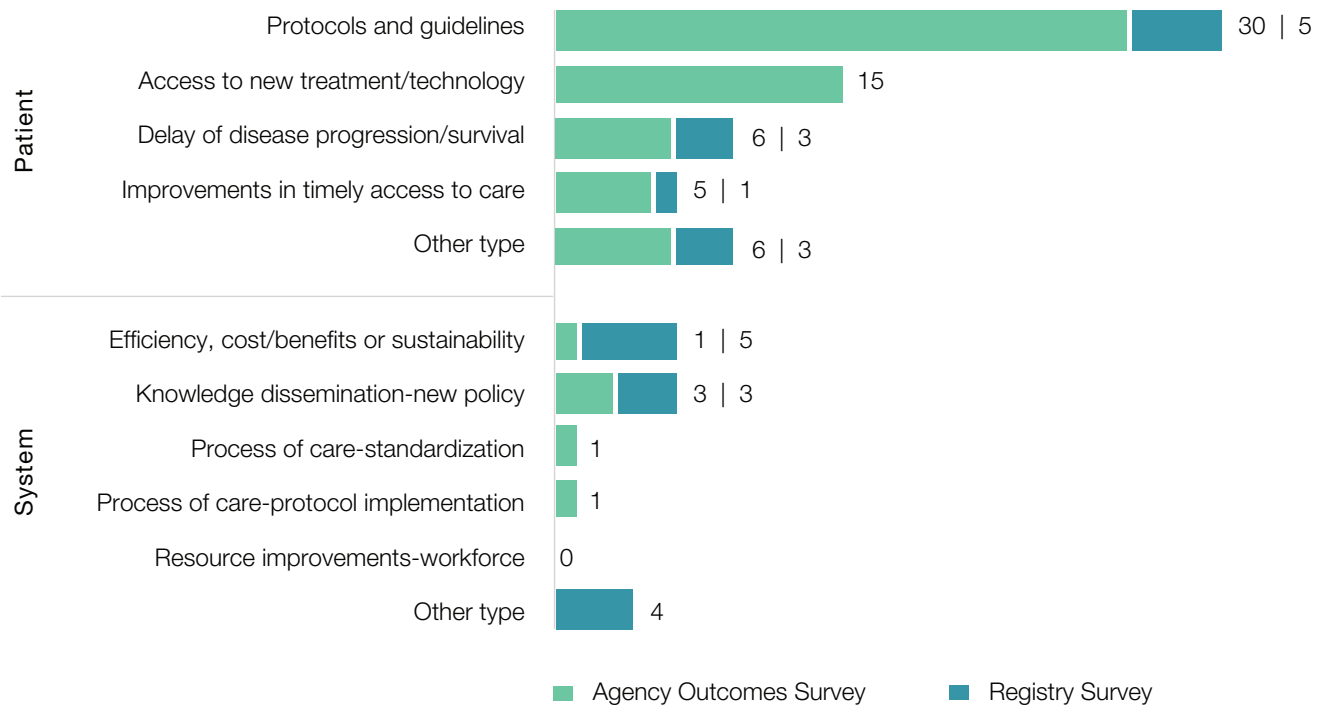


TABLE 2 Key Agency Achievements—Outcomes Survey

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
Scientists at the BC Cancer Agency (BCCA) published research that brings new hope for the treatment of high-risk childhood sarcomas. The BCCA scientists made the discovery by studying a previously unrecognized pathway involving two proteins, YB-1 and HIF1α.	This study is extremely impactful as very little is known about the biology of how aggressive sarcoma cells spread to other organs. Sarcomas are malignant (cancer) cells that form in soft tissues of the body and are very difficult to treat because they have a high tendency to spread. This research has identified a significant protein function as a driver in childhood sarcomas and provides proof of a drug target that may be able to halt the spread of childhood sarcomas.	Patient: Delay of disease/ survival
A landmark study published in Nature Genetics and Nature Methods by BCCA scientists provides critical insight into the invasive spread of the most malignant form of ovarian cancer.	The discovery, made possible through genomic sequencing techniques and novel software developed at the BCCA, answers some key unknowns about how deadly ovarian cancer spreads and the make-up of the cancer cell groups within the patient. Findings indicate that high grade serous ovarian cancer cells may spread throughout the abdomen, unlike most cancers that spread through the blood stream or lymph system. This provides insight that could inform future treatments.	Patient: Access to new treatment/technology

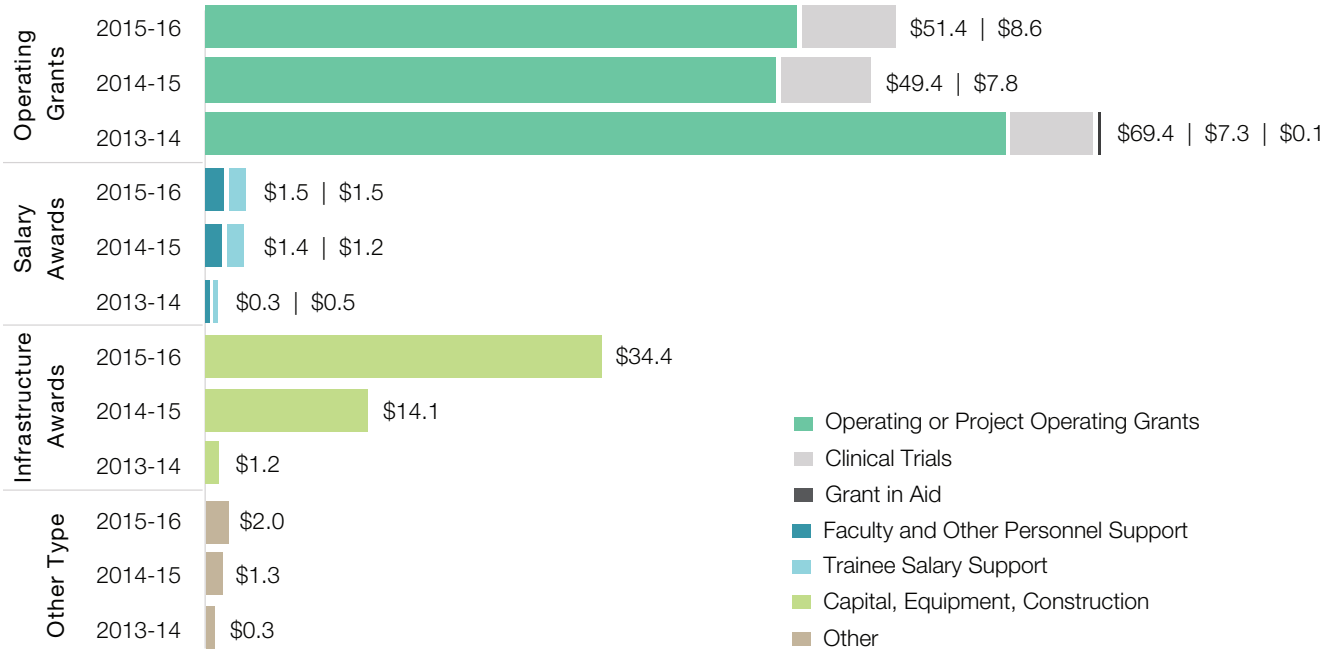
Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
A WHRI researcher was the principal investigator of a study on childbirth in BC that led to the development of new scales which measure women's experience of communication with maternity care providers. These tools have been included in a World Health Organization global scan for novel instruments to assess quality and safety across high and low resource countries.	These tools achieve improved maternal wellbeing due to the promotion of respect and autonomy for women's decision making in communication exchange with maternity care providers. They help improve maternal and fetal health by assuring benchmark levels of maternity care quality and safety internationally.	Patient: Access to new treatment or technology System: Knowledge dissemination—new policy
The Bugs and Drugs guide to antibiotic prescribing was updated with input from PHSA and other researchers and is in broad use by clinicians throughout BC and AB.	Since adopting this guide, antibiotic prescribing is down about 15% in BC, mostly through lower rates of unnecessary prescribing.	Patient: Protocols and guidelines
BCMHARI investigators carried out studies and reported findings on patients treated with medications in programs with oversight or direct management by BCMHSUS. Seven publications resulted.	Studies reported new strategies to assess the value of different sites of drug injection for long-acting antipsychotics (4), and reported on side-effects or toxicities of prescribed and over the counter medications (3). These are important in risk management and ensuring patients receive safe, effective treatments.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy System: Efficiency, cost/ benefits or sustainability
Health Canada approved the serogroup B meningococcal vaccine on the basis of data generated by a research network led by a researcher at BC Children's Hospital Vaccine Evaluation Centre. The vaccine is now available for clinical use in Canada. Meningococcal disease is a dangerous bacterial infection that can lead to meningitis, an inflammation of the membranes covering the brain and spinal cord, and bacteremia or septicemia, infections of the blood.	The serogroup B meningococcal vaccine is now available to prevent meningococcal disease infection in infants to 17-year-olds and in adults who are at high risk of infection due to an outbreak.	Patient: Access to new treatment/technology
BC Children's Hospital researchers evaluated the clinical protocols that guide the induction of labour in pregnant women in the Fraser Health Authority (FHA) to support the best possible outcomes for mothers and babies. The results of this evaluation informed the updating of clinical policy and procedure for the FHA.	The updated policies and procedures on inducing labour improve patient safety and optimize newborn outcomes.	Patient: Protocols and guidelines

Producing and Advancing Knowledge

In FY 2015–16, researchers affiliated with BCCA were awarded a total of $99,332,395 in research funding, a 32% increase over last fiscal year. The amount awarded as Operating Grants ($59,964,370) makes up 60% of total funding received. The greatest variability in funding type over the past eight years, is with Infrastructure Awards which reached 35% of total awards this year but has been as low as 1.5% in FY 2013–14. This year's amount, $34,408,811, which represents 35% of total awards for FY 2015–16 is the result of a large grant in excess of $31M for one researcher. This grant will formally link the three nationally funded genome centres in Montreal (The McGill University and Genome Quebec Innovation Centre), Toronto (The Centre for Applied Genomics at Toronto's Hospital for Sick Children) and Vancouver (Canada's Michael Smith Genome Science Centre at the BC Cancer Agency) to build an unprecedented resource that will enhance the national capacity for sequencing and informatics analysis. A breakdown of funding types and subtypes can be found in Figures 15.

BCCA's portion of the Indirect Costs Program grant for FY 2015–16 is $1,578,828, but is not included in total research funding or the figures below.

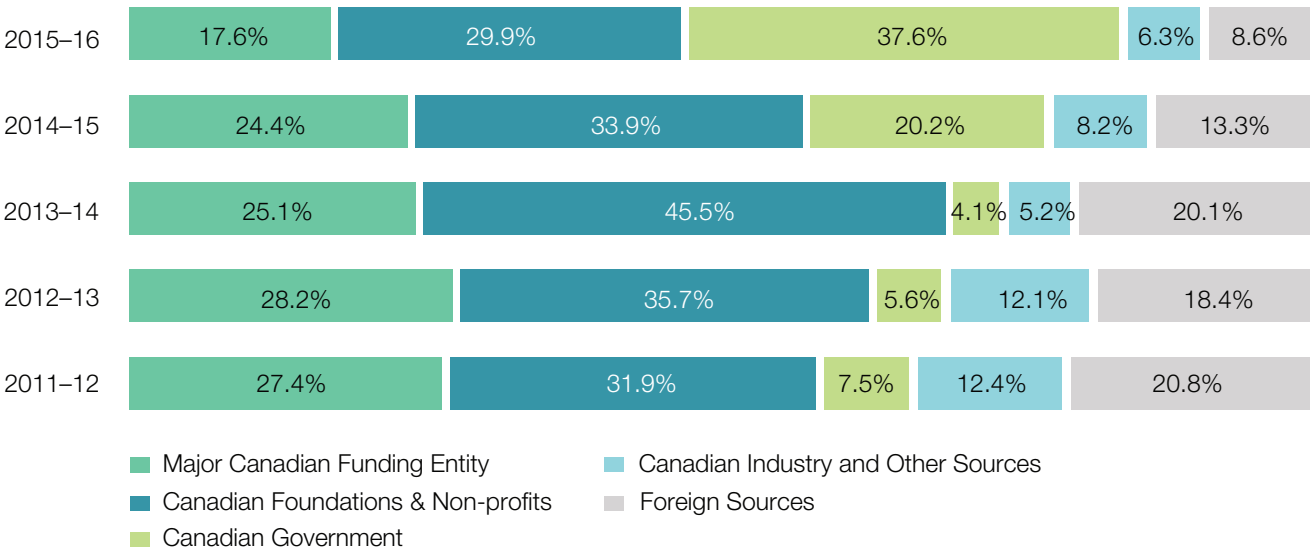
FIGURE 15 **Total BCCA Research Funding by Funding Type and Sub-type by Fiscal Year**



(values are in millions)

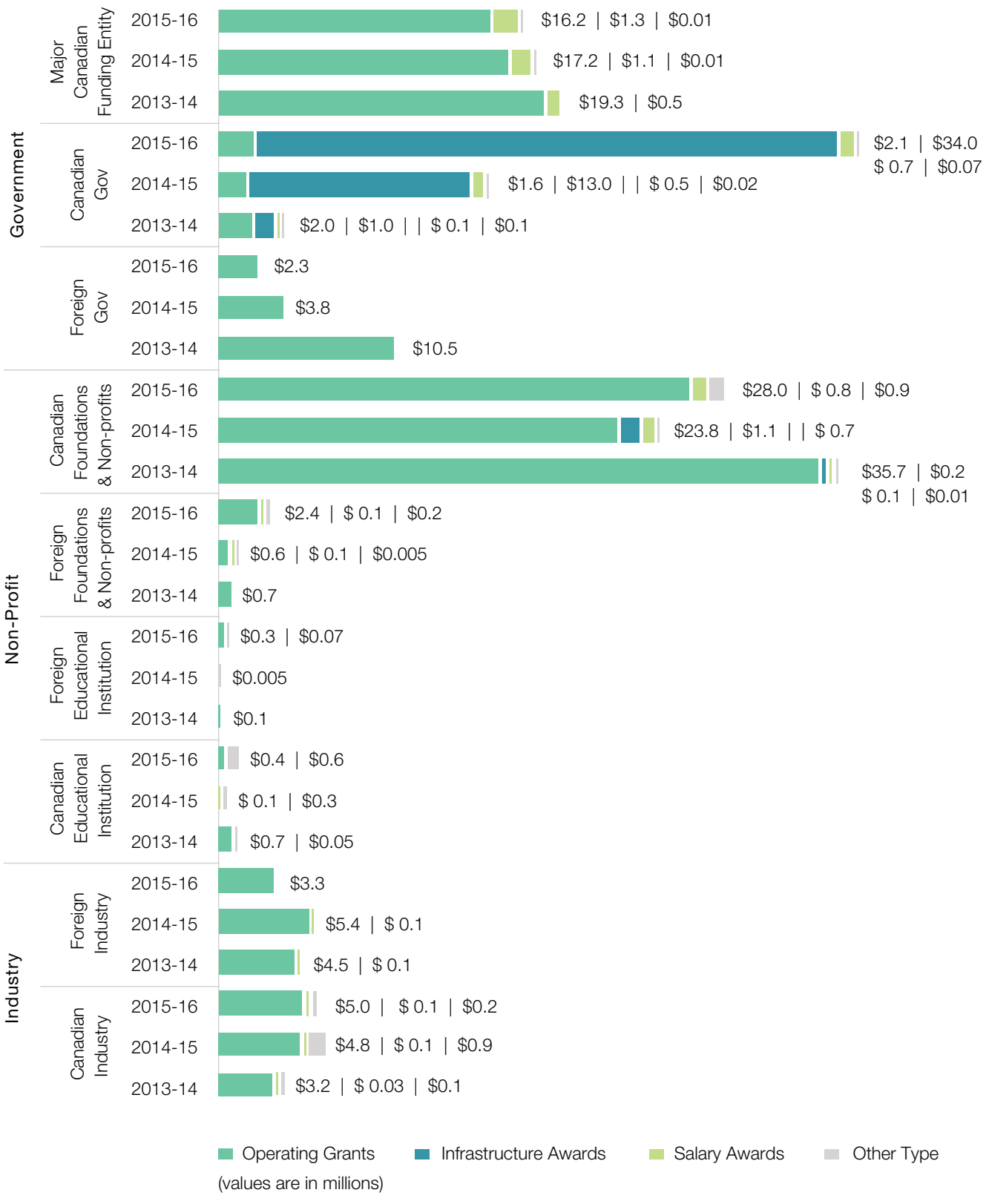
Figure 16 shows the percentage of funding by funding source category for the past five fiscal years. The Major Canadian Funding Entity category includes CIHR and its Institutes, Genome Canada and the Provincial Genome Agencies, Michael Smith Foundation for Health Research (MSFHR), Natural Sciences & Engineering Research Council (NSERC), and the Social Sciences & Humanities Research Council (SSHRC). Of note is the large increase in the Canadian Government category to 38% for FY 2015–16 from 20% last year. This increase can be attributed to the large grant detailed in the previous page. While there has been fluctuation between categories, Canadian sources of funding have remained approximately 80% of total funding, each year. Of note is that both the Major Canadian Funding Entities and the Canadian Foundations and Non–profits have continued a three-year decline from a high of 70% in FY 2013–14 to a low of 47.5% this year.

FIGURE 16 **Percentage of BCCA Research Funding by Funding Source Category by Fiscal Year**



As in the PHSA overall section, BCCA's Total Award Funding is shown by RISe sector, Funding Source Category and Funding Type. In FY 2015–16, the top funding sources are Canadian Government, Canadian Foundations & Non-profits and the Major Canadian Funding Sources (CIHR, MSFHR, NSERC, SSHRC and Genome Canada). Figure 17 details the major funding categories by funding type.

FIGURE 17 BCCA Research Funding by RISe Sector, Funding Source Category and Type by Fiscal Year

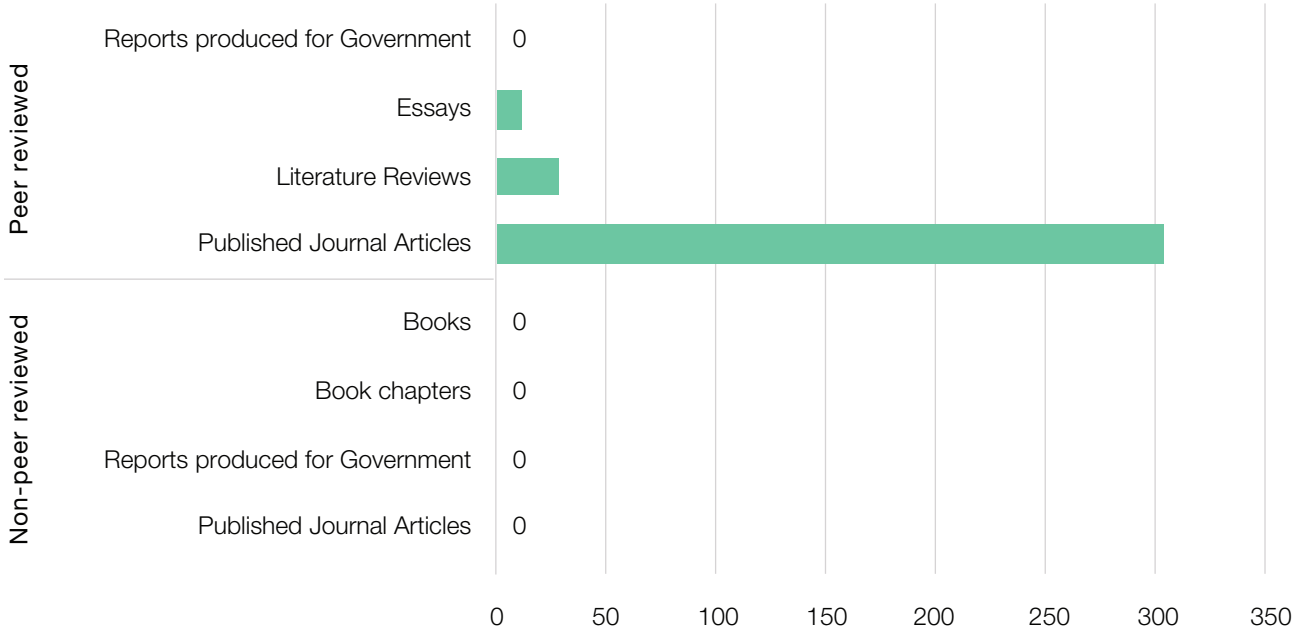


BCCA had success in the CIHR transitional operating grant competition for March 2015, with five approved applications and is in line with historical figures for other Open Operating Grant Competitions. BCCA received four and a half (4.5) approvals in the first Foundation Scheme Pilot representing a total of $14,096,829. The half application/approval is shared with CFRI. The table below shows CIHR grant application success rates for BCCA compared to the national average as well as number of applications submitted and approved for the TOOGP.

Grant Funding Opportunity	Nat'l Overall Success Rate % (Approved/Submitted)	UBC Success Rate % (Approved/Submitted)	BCCA Success Rate % (Approved/Submitted)
TOOGP—March 2015	18.6% (500/2682)	13.6% (35/258)	15.6% (5/32)
Foundation Scheme Pilot #1	23% (150/467 stage 2–3)	23 approved	4.5 approved

Total number of publications by type and category of peer vs. non-peer review is seen in Figure 18. BCCA had a total of 341 publications which is a decrease of 35% from last year but most likely reflects the process of manual data collection rather than scholarly output.

FIGURE 18 **Total Number of BCCA Publications by Type and Category**

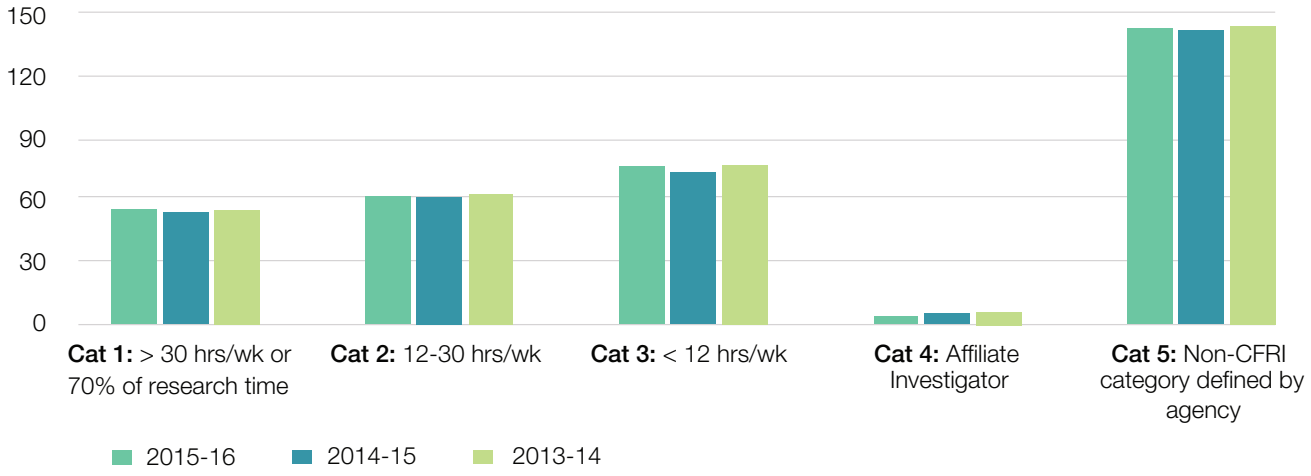


Building Research Capacity

BCCA has a total of 325 researchers in FY 2015–16 in categories 1, 2, 3 and 5, and 4 in Category 4. While adoption of the CFRI category classifications is in place, a significant amount (138) of the total researchers are in Category 5, which is an agency specific category used to describe researchers that do not meet CFRI category classifications.

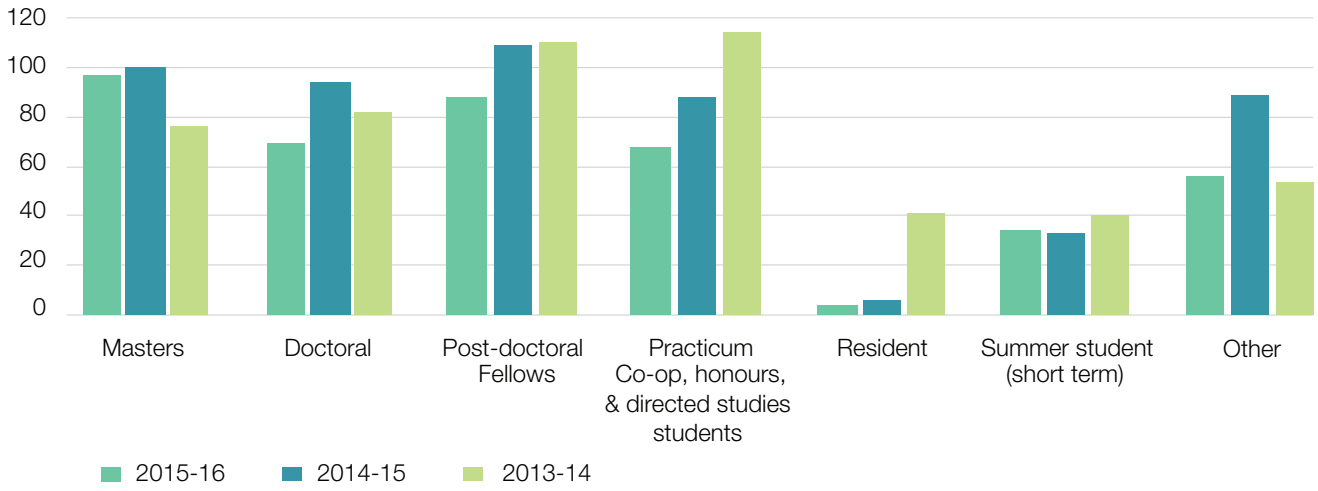
For BCCA, the majority of Category 5 researchers are Medical or Radiation Oncologists, Program or Practice Leaders, Research Scientists and Nurses. As in past year's reports, researchers whose funding is officially split 50/50 between research entities are classified as 0.5. See Figure 19 for the number of researchers by category.

FIGURE 19 **Total Number of BCCA Researchers by Category and Fiscal Year**



During FY 2015–16, BCCA researchers provided training and supervision to a total of 416 trainees. See Figure 20 for the number of trainees by type. Factors influencing the number of trainees include but are not limited to, operating grant success rates; whether trainees can obtain fellowships to secure their own funding, and how often trainee competitions are held and the envelope of funding. Some variability results from the manual data collection process.

FIGURE 20 **Total Number of BCCA Trainees by Type and Fiscal Year**

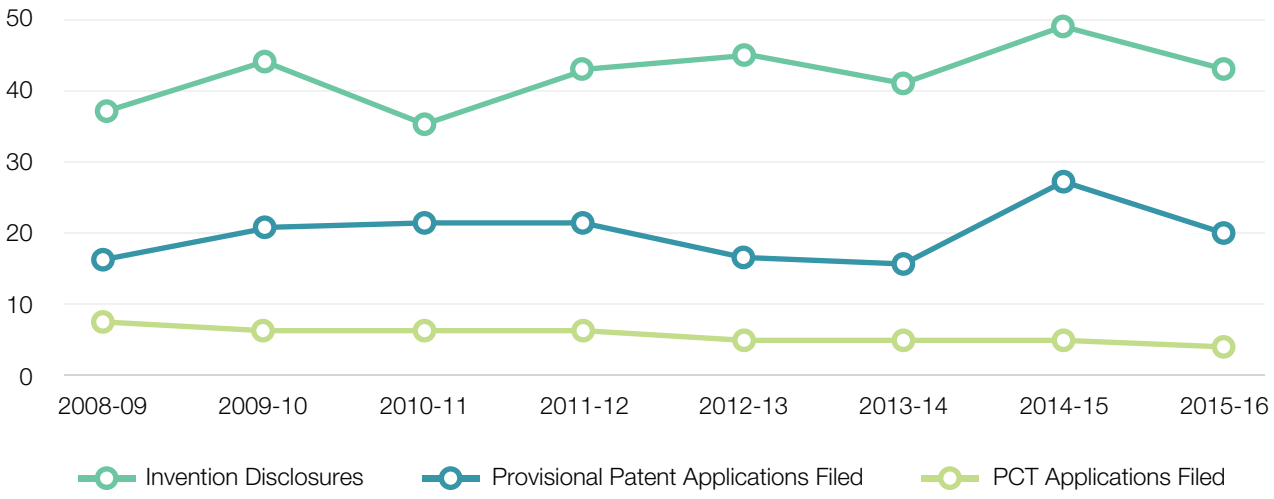


Achieving Economic Benefits and Innovation

BCCA Technology Development Office (TDO) Activities

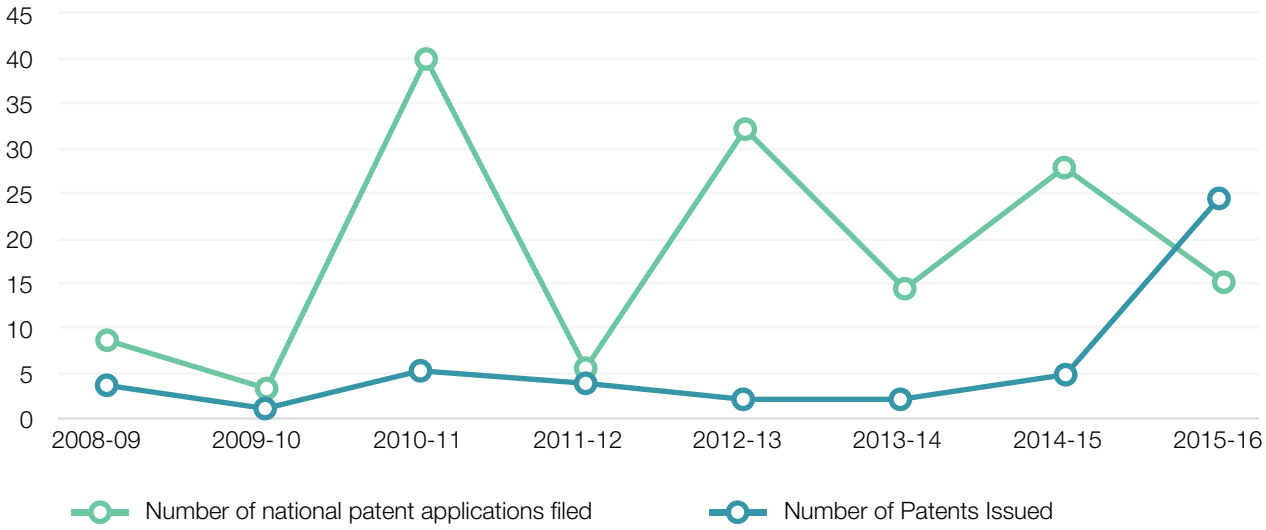
Patent Activity has remained relatively stable over the last eight fiscal years (see Figure 21). Invention disclosures are primarily internal BCCA documents, filed with TDO to inform the decision of whether or not to proceed with the patent process. The next stage in the patent process is to file provisional patent applications followed by patent cooperative treaties, or PCTs, which act as a gateway to world-wide patents.

FIGURE 21 BCCA TDO Invention Disclosures, Provisional Patent and PCT Applications by Fiscal Year



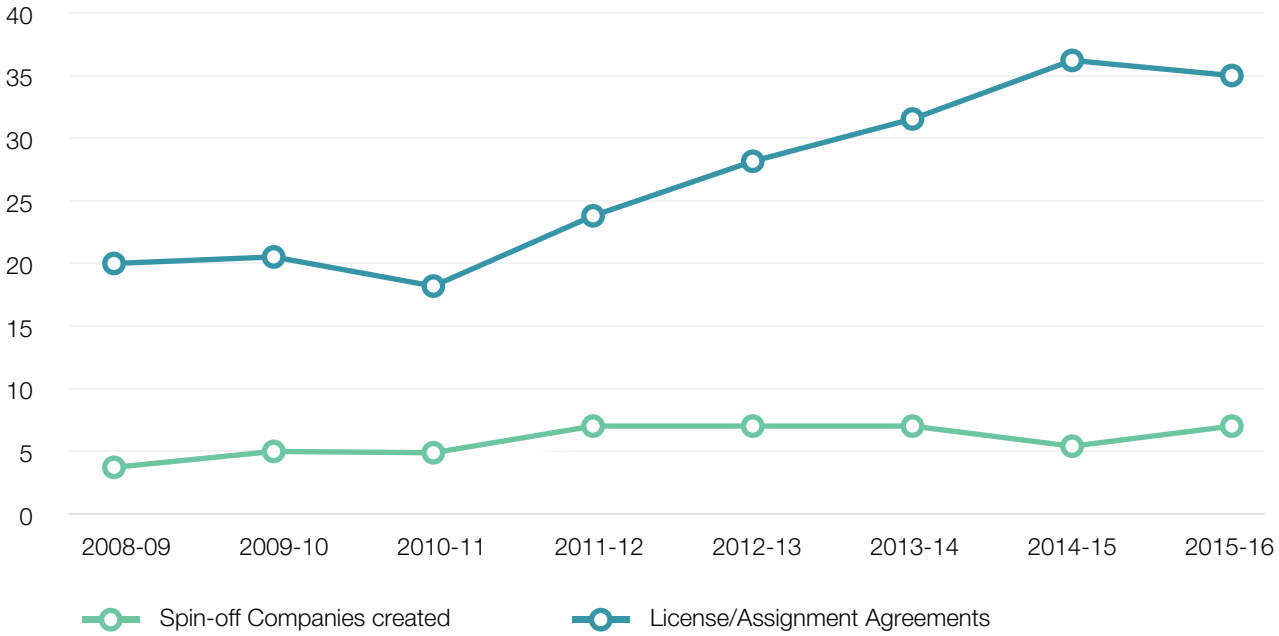
National patent applications are then filed with each step involving greater specificity. The large increase in issued patents in FY 2015–16 are a result of four patents relating to the Prosigna breast cancer test licensed to nanoString and 13 patents relating to the Essa pharmaceuticals spinoff/start-up company which is developing new drugs for the treatment of prostate cancer. Once technologies are licensed, then the partner typically funds patent filings in multiple countries and is especially true for new pharmaceuticals. See Figure 22 for a breakdown by fiscal year.

FIGURE 22 BCCA TDO National Patent Activity by Fiscal Year



In FY 2015–16, there were 35 active license agreements (see Figure 23), including six new licenses/assignment agreements. There were no new spin-off companies created but Logipath Medical became active again. Other active Spin-off companies include Aquinox Pharmaceuticals, Essa Pharmaceuticals, Repeat Diagnostics, Verisante and Fusion Genomics.

FIGURE 23 BCCA License Agreements and Spin-Off Companies by Fiscal Year



IP related revenue, in accordance with UBC (University Industry Liaison Office UILO) definitions (see Glossary: Appendix 4, page 88) is reported in Table 3. Expenses related to patenting, license IP and legal costs totaled $471,176.12 in FY 2015–16. Realized licensing revenue per the distribution agreements totals $274,585 with $69,093.23 to PHSA and $205,492.16 to BCCA departments. While distribution agreements vary, typically the inventor receives 50% of the net licensing revenue, with the remainder split between PHSA, BCCA departments, and UBC for those researchers with a UBC affiliation.

TABLE 3 TDO IP Related Revenue

IP Related Revenue	FY 2013–14	FY 2014–15	FY 2015–16
Royalties	$387,894.13	$731,038.63	$337,646.78
Equity Liquidated		$37,032.37	$257,794.00
License Fees	$54,725.00	$200,740.00	$111,500.00
License Management	$314,161.97	$358,490.88	$299,798.18
Option Fees			$5,000.00
Technology Assignment			
Gross Licensing Revenue (total)	**$756,781.10**	**$1,327,301.88**	**$1,011,738.96**

Advancing Health and Policy Benefits

See Table 4 for a detailed breakdown of clinical trial activity by fiscal year. Of note, is that approximately 24% of BCCA trials had no enrollment figures in the REB applications, an improvement over the 26% figure from FY 2014–15. Once these fields are made mandatory as opposed to optional, enrollment figures should increase.

TABLE 4 BCCA Clinical Trials

	11–12	12–13	13–14	14–15	15–16
Total Number of Clinical Trials active during the FY	272	300	321	317	303
Status of the Trial at the end of the FY:					
Total Number of Active Trials	151	212	274	234	249
Total Number of Trials that closed during the FY	121	88	47	83	54
Enrolment Numbers:					
Expected Local Subject Enrolment (for the term of the study)	36,022	35,899	36,653	41,867	41,598
Total Cumulative Subject enrolment at the end of the FY	24,439	25,515	27,299	28,521	29,244

The following Table 5 reflects a sample of key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2015–16 as a result of research driven by BCCA researchers, and their corresponding benefits. These outcomes represent important achievements in translational research that are improving patient outcomes and system sustainability.

TABLE 5 BCCA Outcomes Survey Responses

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
Scientists at the BC Cancer Agency (BCCA) published research that brings new hope for the treatment of high-risk childhood sarcomas. The BCCA scientists made the discovery by studying a previously unrecognized pathway involving two proteins, YB-1 and HIF1α.	This study is extremely impactful as very little is known about the biology of how aggressive sarcoma cells spread to other organs. Sarcomas are malignant (cancer) cells that form in soft tissues of the body and are very difficult to treat because they have a high tendency to spread. This research has identified a significant protein function as a driver in childhood sarcomas and provides proof of a drug target that may be able to halt the spread of childhood sarcomas.	Patient: Delay of disease/ survival
A landmark study published in Nature Genetics and Nature Methods by BCCA scientists provides critical insight into the invasive spread of the most malignant form of ovarian cancer.	The discovery, made possible through genomic sequencing techniques and novel software developed at the BCCA, answers some key unknowns about how deadly ovarian cancer spread and the make-up of the cancer cell groups within the patient. Findings indicate that high grade serous ovarian cancer cells may spread throughout the abdomen, unlike most cancers that spread through the blood stream or lymph system. This provides insight that could inform future treatments.	Patient: Access to new treatment/technology
Researchers at the BCCA and Simon Fraser University (SFU) have developed a ground breaking method to identify and separate stems cells that reside in the tonsils. This research which will shed new light on oral cancer was published in Stem Cell Reports.	Stem cells in other body tissues have been well studied, but little is known about tonsil stem cells. Ninety percent of human tonsil cancers show evidence of human papillomavirus (HPV) infection, but little is known about its role in oral cancer. Researchers believe it is a key player in cervical cancer. When the cells were purified and incorporated with a cancer-causing gene normally transmitted by HPV the cells grew abnormally and created what one might imagine the beginning stages of human tonsil cancer would look like.	Patient: Delay of disease/ survival

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
A new test developed by the BCCA in collaboration with the Institute of Cancer Research, London, UK, University of North Carolina at Chapel Hill, and the University of Wisconsin-Madison could predict whether breast cancer will spread to the brain.	Almost 4000 patients with breast cancer were analyzed and it was found that testing for high activity in a particular gene called alpha beta-crystallin could pick out women who were at greater risk for developing secondary brain tumours compared to women who tested negative. Ultimately, the test could be used to identify women with advanced specific types of breast cancer to enter trials of new treatments.	Patient: Access to new treatment/technology
A prostate cancer drug developed by researchers at the BCCA and UBC is entering human clinical trials.	The drug is specifically designed to target and shut down metastatic castrate resistant prostate cancer when other treatments have failed. This drug, EPI-506, is over 10 years in the making and is the first to target the back end of the androgen receptor protein, called the N-terminal domain. The androgen receptor drives most prostate cancer cells and makes them sensitive to hormones such as testosterone.	Patient: Access to new treatment/technology
Scientists at the BCCA and UBC were able to produce breast cancer from normal human breast cells using a single cancer gene.	The study, published in Nature, shows that introducing a single mutant gene into cells isolated from normal human breast tissue can cause them to grow breast cancer in mice that lack an immune system. This finding disproved the longstanding assumption that the development of human breast cancer requires a long time to accumulate multiple genetic changes. This now makes it feasible to study the initial changes that cause a normal human breast cancer cell to become malignant. This approach may bring about improved outcomes based on the identification of early changes that should be shared by all cells in a given breast tumours. These changes could provide new indicators for identifying breast cancers at a much earlier stage when they can be more effectively treated.	Patient: Delay of disease/ survival
Research led by the BCCA and the Hospital for Sick Children (SickKids) Toronto, ON, found that the biology of a tumour changes when childhood brain cancer recurs.	Using samples of children's and mouse modes' medullobastoma tumours, the researchers found that the biology of tumours at the time of diagnosis had significantly transformed in recurrent medulloblastoma tumours. These findings suggest that targeted therapies initially tested on, and found to be successful on initial untreated tumours in the lab, are ineffective in treating recurrent tumours. This is because the identified targets in the initial tumour are absent in the recurrent tumour. This explanation could change the way drugs are tested in children.	Patient: Access to new treatment/technology

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
Scientists at the BCCA, Vancouver Coastal Health Authority (VCH), and UBC have made a breakthrough in understanding the origin and development of cancer that occurs in the uterus and ovary simultaneously, substantiating an approach to managing the disease practiced by doctors in BC. Findings were published in the Journal of National Cancer Institute.	Synchronous endometrial and ovarian (SEO) cancer is when tumours on the endometrial lining of the uterus appear simultaneously with tumours on the ovary and vice-versa. The spread of a tumour from one organ to another is usually an indication of an advanced stage of cancer that requires aggressive treatment. This study found that SEO tumours behave as if they are independent, localized early stage tumours, an example of what scientists call “pseudo-metastasis”. This is a significant finding, and one that supports current BC practice to treat these tumours conservatively by surgically removing them. On a global scale, this will impact the treatment of SEO cancer patients where chemotherapy and/or radiation therapy, both with severe side-effects, have been used.	Patient: Access to new treatment/technology
An international study involving BCCA researchers has discovered the genetic cause of a rare gastric condition that can lead to stomach cancer.	The discovery uncovered three extremely rare genetic mutations that cause gastric adenocarcinoma and polyposis of the stomach (GAPPS). This means that in the future, individuals who have family member with GAPPS will be able to have a DNA test to determine whether they will develop the condition and stomach cancer. Translational work is underway to bring this discovery into clinical lab based testing to identify patients with a genetic risk of gastric cancer.	Patient: Access to new treatment/technology

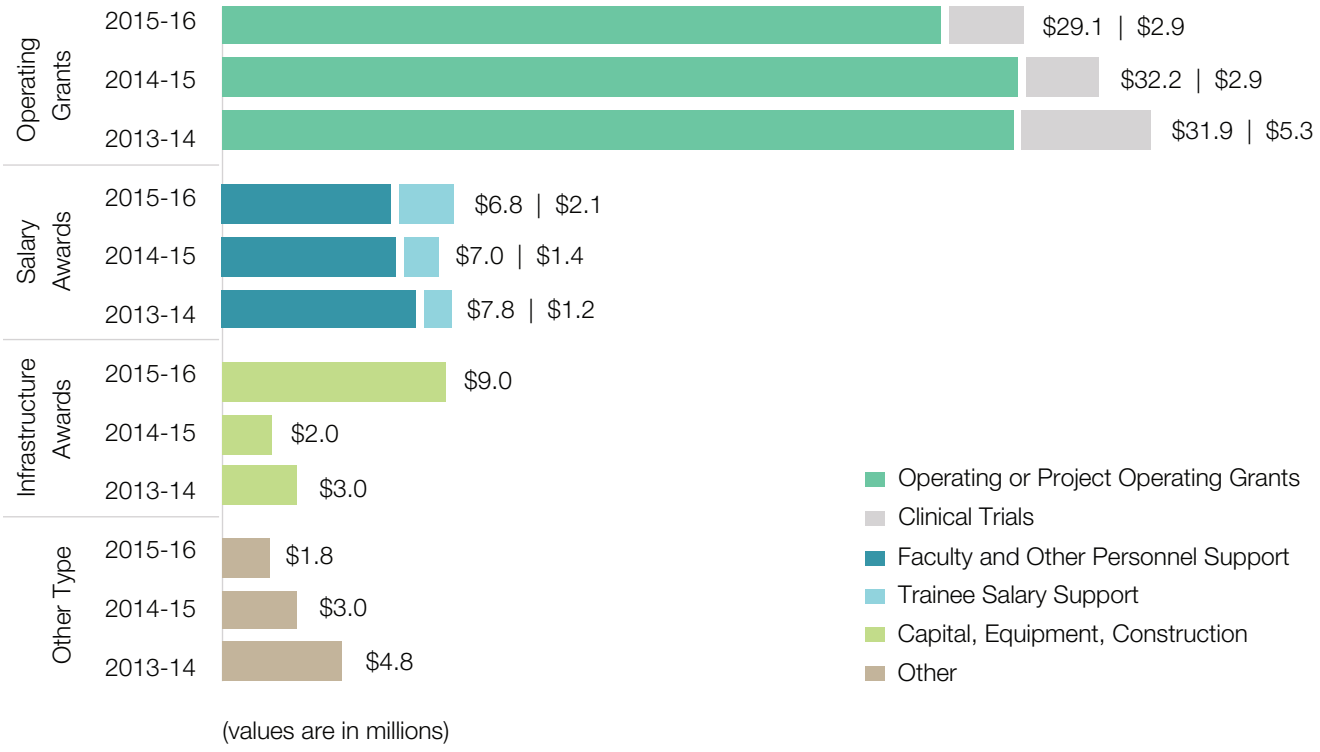
CHILD & FAMILY RESEARCH INSTITUTE

Producing and Advancing Knowledge

In FY 2015–16, researchers affiliated with CFRI were awarded a total of $51,862,867 in research funding, an increase of $3,351,879 (7%) over last FY. The amounts awarded as Operating Grants ($32,010,333) and Infrastructure Awards ($9,041,722) make up approximately 79.2% of total funding received. A breakdown of funding types and subtypes can be found in Figure 24. Figure 25 shows funding by funding source category. CFRI's portion of the Indirect Costs Program grant totaled $2,034,430, for FY 2015–16 but is not included in total research funding or the figures below.

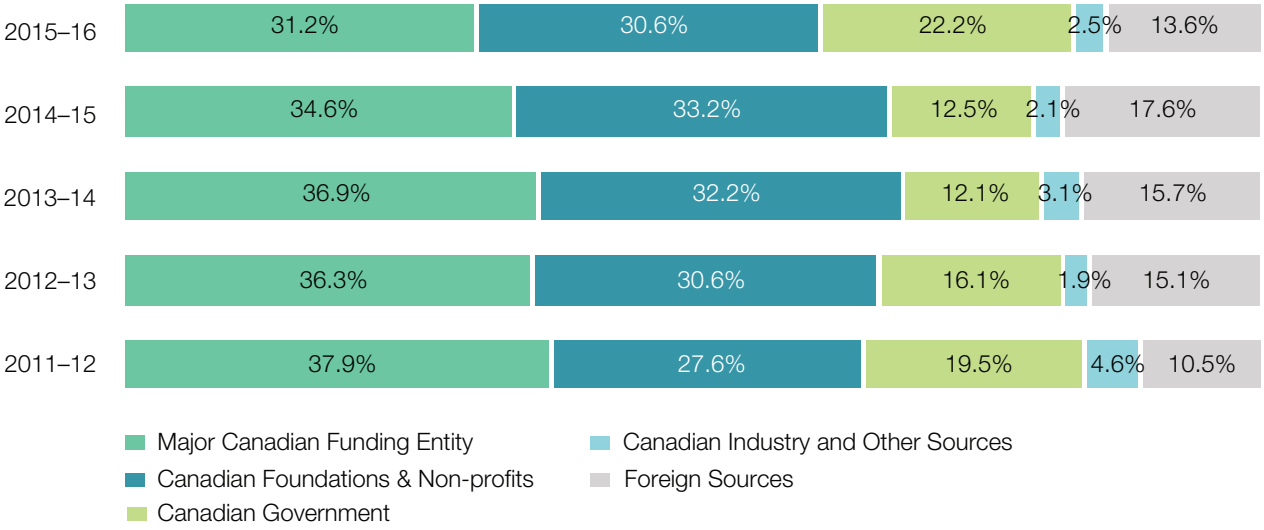
A large $8.1-million-dollar infrastructure grant from BC Knowledge Development Fund (BCKDF) and Canada Foundation for Innovation award was received by a CFRI researcher in FY 2015–16. This grant was awarded to the Canucks for Kids Fund Childhood Diabetes Laboratories at CFRI/BC Children's Hospital. The grant supports new state-of-the-art technology for research on the genetic causes of diabetes, preventing diabetes, and developing new therapies, as well as community outreach to vulnerable and underserved populations.

FIGURE 24 **Total CFRI Research Funding by Funding Type and Sub-type by Fiscal Year**



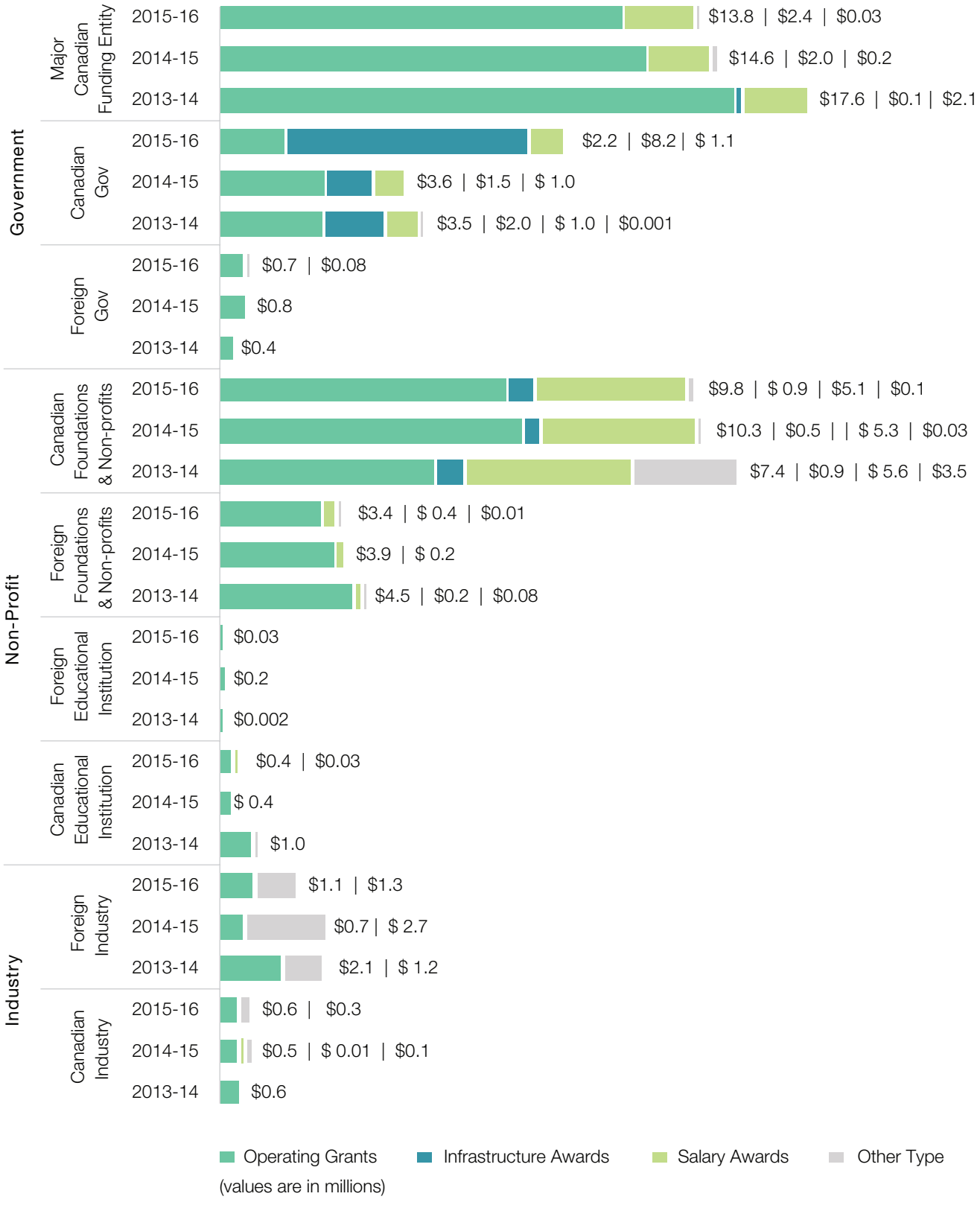
(values are in millions)

FIGURE 25 Percentage of CFRI Research Funding by Funding Source Category by Fiscal Year



The top three funding categories are Major Canadian Funding Entity (38%), Canadian Foundations & Non-Profits (30%) and Canadian Government (18%). Figure 26 details the RISe sector and funding categories by funding type.

FIGURE 26 CFRI Research Funding by RISe Sector, Funding Source Category and Type by Fiscal Year

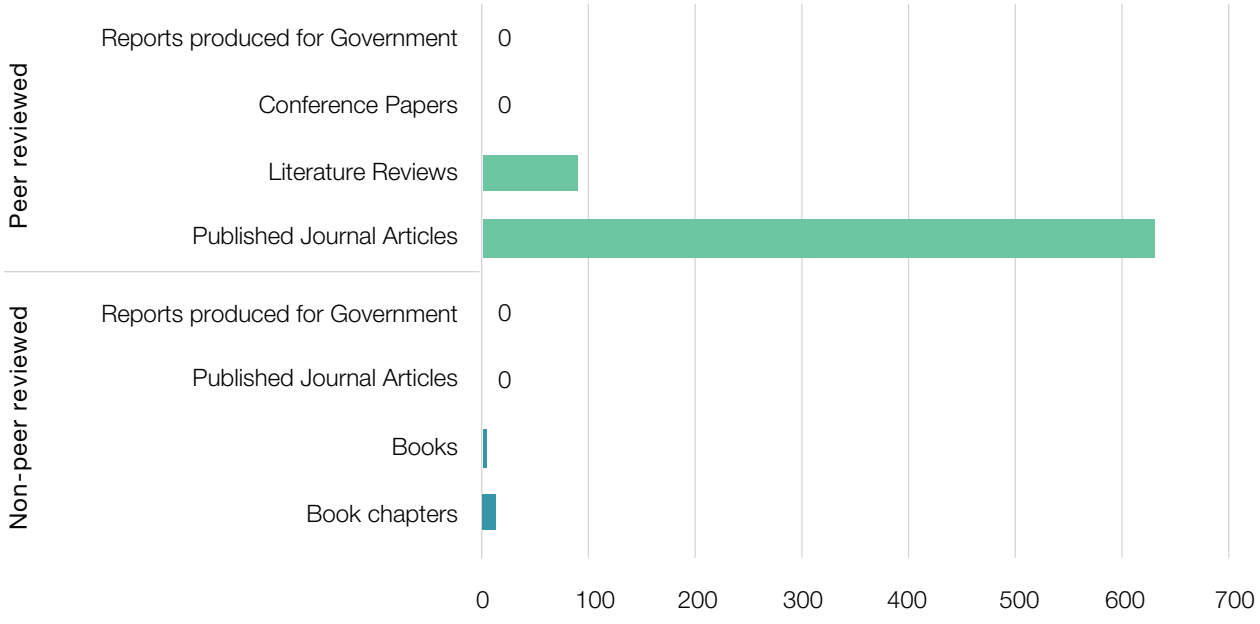


CFRI exceeded the national average in the CIHR transitional operating grant competitions for March 2015 with a 22.6% success rate. The March 2015 competition resulted in seven approved applications and is in line when compared with historical figures for other Open Operating Grant Competitions. CFRI received 2.5 approvals from 14.5 submissions in the first Foundation Scheme Pilot. The half application/approval is shared with BCCA. The table below shows CIHR grant application success rates for CFRI compared to the national average as well as number of applications submitted and approved for the TOOGP.

Grant Funding Opportunity	National Overall Success Rate % (Approved/Submitted)	UBC Success Rate % (Approved/Submitted)	CFRI Success Rate % (Approved/Submitted)
TOOGP—March 2015	18.6% (500/2682)	13.6% (35/258)	22.6% (7/31)
Foundation Scheme Pilot #1	23% (150/467 stage 2–3)	23 approved	2.5 approved

CFRI had 837 publications this year, with 98% of them being peer reviewed. Total number of publications by type and category of peer vs. non-peer reviewed, is seen in Figure 27 for. Peer review represents the gold standard for scientific credibility. The agency total represents the number of publications where at least one agency researcher was an author of the publication. When researchers from more than one research entity/agency collaborate on the same publication, it is counted once for each agency. CFRI includes case reports and essays in journal articles and accepts e-journal articles.

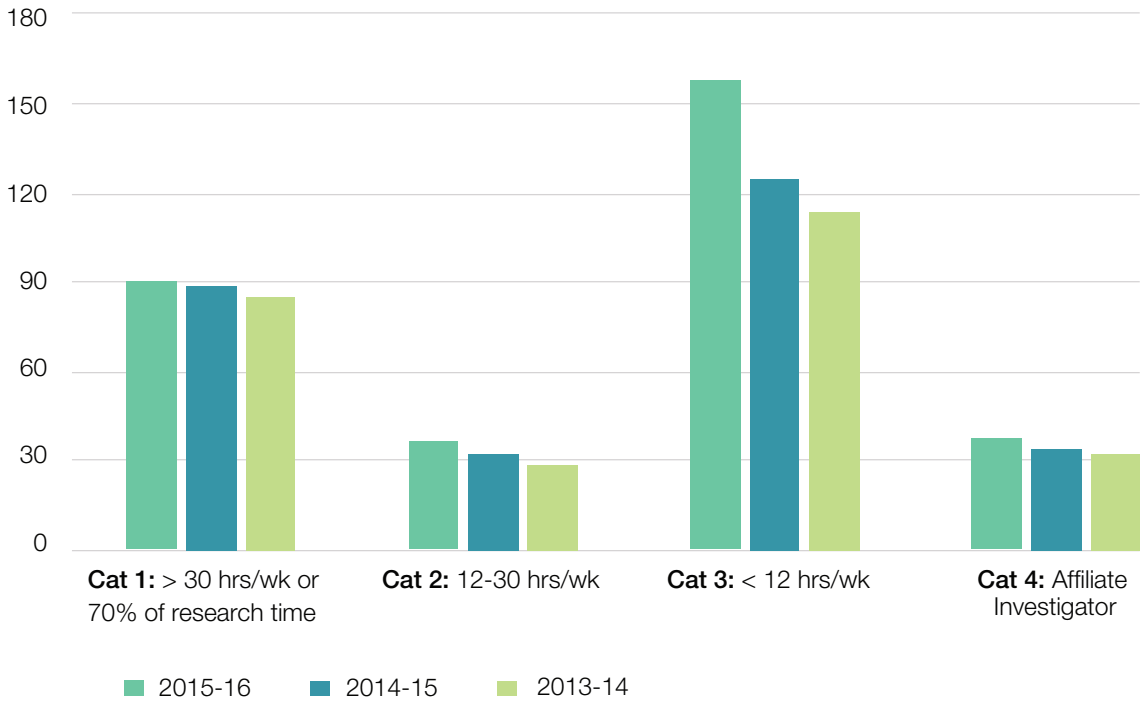
FIGURE 27 Total Number of CFRI Publications by Type and Category



Building Research Capacity

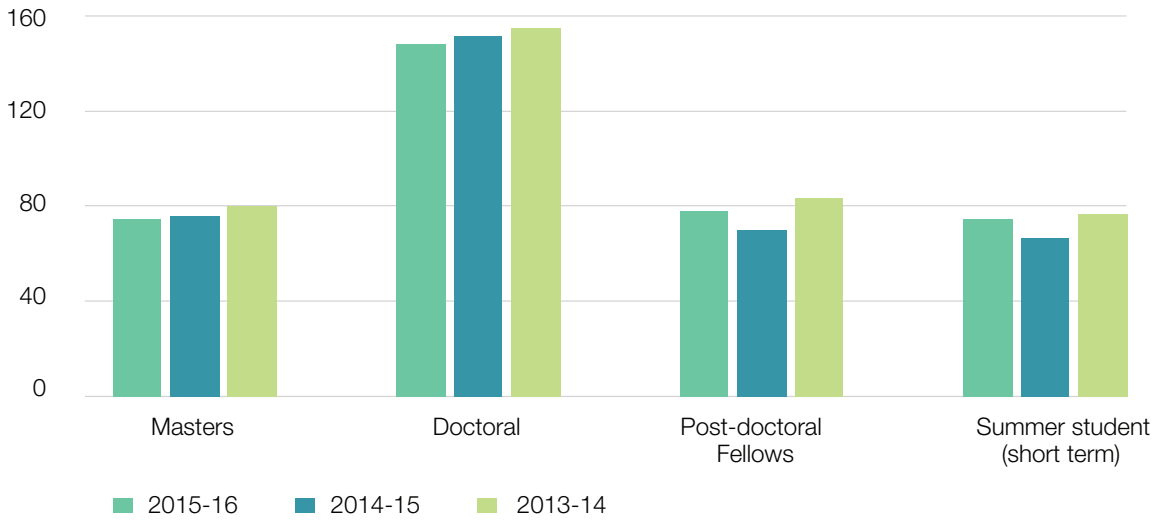
CFRI has a total of 284 researchers in categories 1–3. The distribution of these researchers is represented in Figure 28. Researchers in categories 1–3 are primarily based on the Children's & Women's Health Centre of BC campus with the largest proportion of the members being split between Category 1—those that have greater than 30 hours per week or 70% of their time protected for research and Category 3—those that have less than 12 hours per week of protected research time. Category 4 members (37 in FY 2015–16) are affiliate investigators that are not based on site but who collaborate with CFRI members. Their primary affiliation will be with another academic and/or research institution. The purpose of this category is to provide official recognition for these individuals who collaborate with CFRI members on a regular basis. The CFRI does not track Category 4 members funding, publications or trainees.

FIGURE 28 **Total Number of CFRI Researchers by Category**



During FY 2015–16, CFRI researchers provided training and supervision to a total of 371 (up 10 from FY 2014–15) trainees. See Figure 29 for number of trainees by type. The CFRI currently tracks full-time research trainees (masters, doctoral and postdoctoral fellows) and summer students undertaking their training at the CFRI. There is numerous co-op or directed studies students attached to the Institute, but due to their brief tenure on site, information on this group is not tracked.

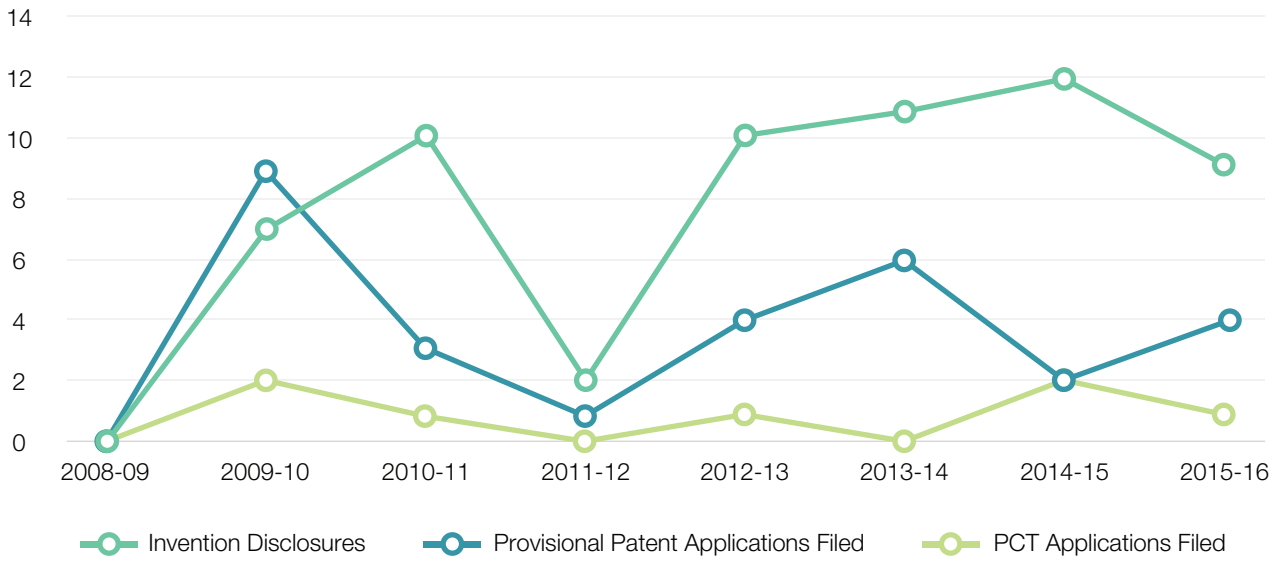
FIGURE 29 Total Number of CFRI Trainees by Type



Achieving Economic Benefits and Innovation

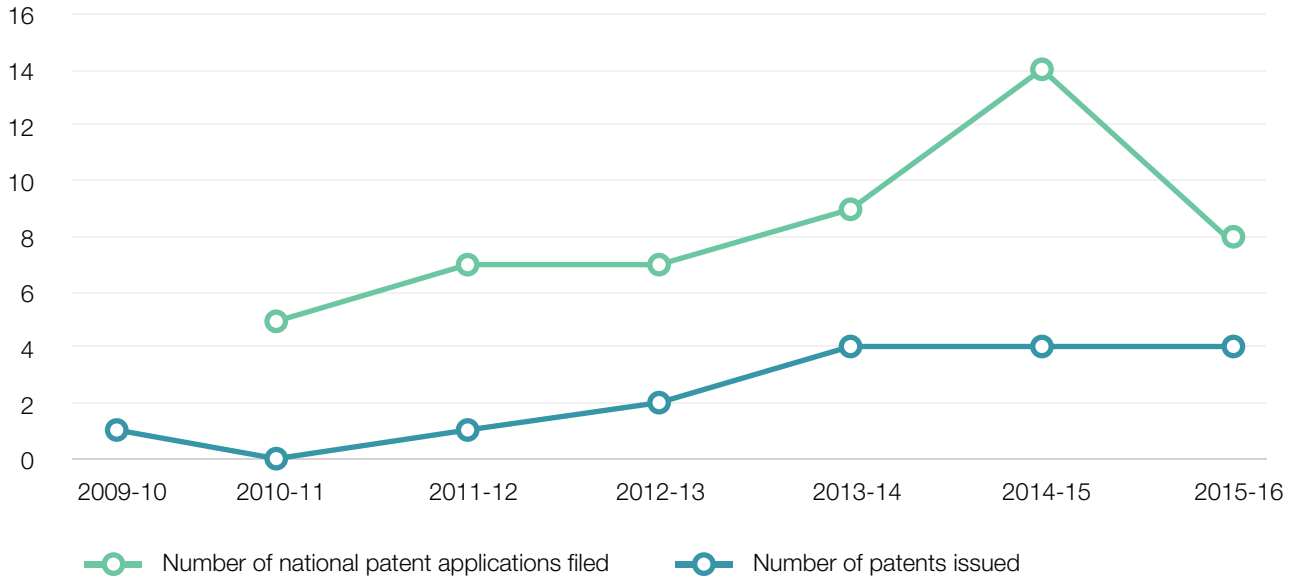
The number of invention disclosures, provisional patent and PCT applications filed by fiscal year are shown in Figure 30.

FIGURE 30 CFRI Invention Disclosures, Provisional Patent and PCT Applications Filed by Fiscal Year



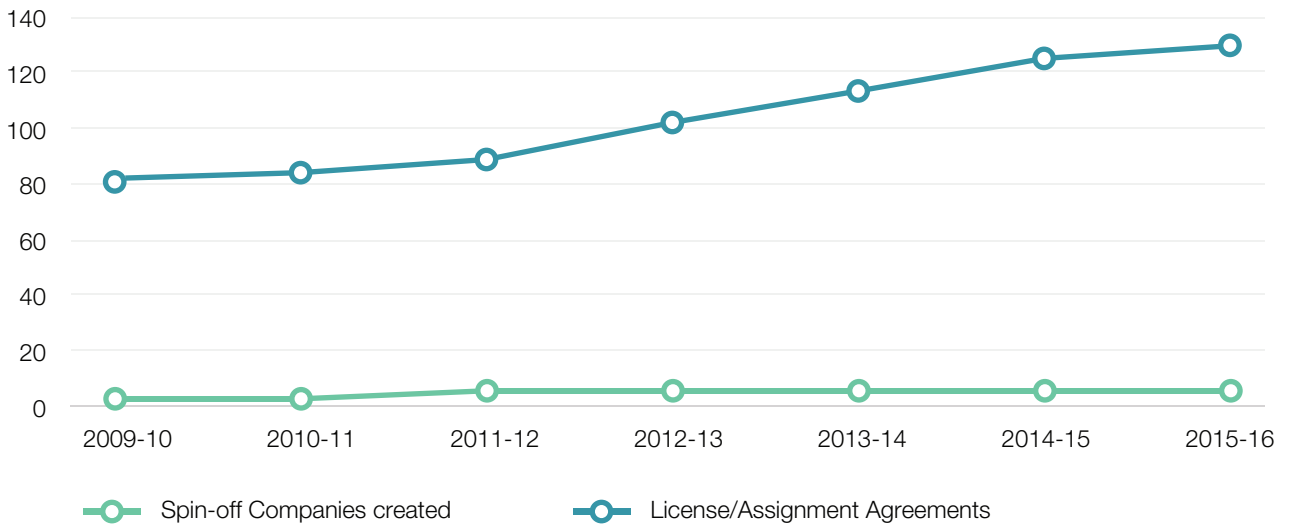
Patents are reported in Figure 31 below. Applications filed in a given year represent different applications than those which are approved in that same year (which typically are the result of applications in previous years). Data is collected and reported by the University of British Columbia University-Industry Liaison Office (UILO).

FIGURE 31 CFRI National Patent Activity by Fiscal Year



In FY 2015–16 there were 128 (up by five) active license/assignment agreements in place (See Figure 32). No new spin-off companies have been created. CFRI holds shares in three active companies—Urodynamix Technologies (publicly traded), Lions Gate Technologies, and BCY Lifesciences (publicly traded). Xenon Pharmaceuticals (private) is held in trust by UBC so is not included in the totals below.

FIGURE 32 CFRI License/Assignment Agreements and Spin-off Companies by Fiscal Year



See Table 6 for CFRI data by fiscal year. CFRI reported no expenses for patenting, legal & related costs for FY 2015–16. Realized revenue per the distribution agreements for FY 2015–16 was $41,295.44.

TABLE 6 CFRI IP Related Revenue

IP Related Revenue	FY 2013–14	FY 2014–15	FY 2015–16
Royalties	$55,375.30	$211,800	$178,795.65
Equity Liquidated			
License Fees			
License Management		$65,800	
Option Fees			
Technology Assignment			
Net Licensing Revenue (total)	$55,375.30	$149,900	$178,795.65

Advancing Health and Policy Benefits

See Table 7 for a detailed breakdown of clinical trial activity by fiscal year. Of note is that approximately 23% of CFRI trials had no enrollment figures as compared to 35% last fiscal year. Once these fields are made mandatory as opposed too optional, enrollment figures should increase.

TABLE 7 CFRI Clinical Trials

	11–12	12–13	13–14	14–15	15–16
Total Number of Clinical Trials active during the FY	146	154	166	183	180
Status of the Trial at the end of the FY:					
Total Number of Active Trials	80	101	133	143	152
Total Number of Trials that closed during the FY	66	53	33	40	28
Enrolment Numbers:					
Expected Local Subject Enrolment (for the term of the study)	9,285	10,037	120,491	102,505	103,936
Total Cumulative Subject enrolment at the end of the FY	2,191	1,851	7,023	31,379	26,846

The following Table 8 reflects a sample of key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2015–16 as a result of research driven by CFRI researchers, and their corresponding benefits. These outcomes represent important achievements in translational research that are improving patient outcomes and system sustainability.

TABLE 8 CFRI Outcomes Survey Responses

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
Health Canada approved the serogroup B meningococcal vaccine on the basis of data generated by a research network led by a researcher at BC Children's Hospital Vaccine Evaluation Centre. The vaccine is now available for clinical use in Canada. Meningococcal disease is a dangerous bacterial infection that can lead to meningitis, an inflammation of the membranes covering the brain and spinal cord, and bacteremia or septicemia, infections of the blood.	The serogroup B meningococcal vaccine is now available to prevent meningococcal disease infection in infants to 17-year old's and in adults who are at high risk of infection due to an outbreak.	Patient: Access to new treatment/technology
A researcher from the Vaccine Evaluation Centre at BC Children's Hospital took part in the Vaccine Acceptance and Uptake Task Group convened by the Public Health Agency of Canada and the Canadian Immunization Committee to develop guidelines and recommendations for the federal government to address vaccine hesitancy and uptake. The recent federal budget allocated more than $14-million to address vaccine hesitancy and uptake based on the guidelines and recommendations that came from this task group.	Improving vaccination rates will help prevent the spread of infectious disease and improve infant and child health across Canada.	System: Knowledge dissemination—new policy
BC Children's Hospital researchers evaluated the clinical protocols that guide the induction of labour in pregnant women in the Fraser Health Authority (FHA) to support the best possible outcomes for mothers and babies. The results of this evaluation informed the updating of clinical policy and procedure for the FHA.	The updated policies and procedures on inducing labour improve patient safety and optimize newborn outcomes.	Patient: Protocols and guidelines
Researchers at BC Children's Hospital investigated the reasons women in the Fraser Health Authority (FHA) who'd had a previous caesarean section and met eligibility criteria were offered the option to go into labour – as opposed to having a planned caesarean – only 30 per cent of the time. Researchers determined a number of barriers to offering vaginal birth after caesarean and developed a policy brief that has been widely circulated to the FHA and Ministry of Health and is currently being reviewed by the Ministry of Health's Provincial Women's Health Strategy Team.	Professional practice guidelines in Canada support allowing women who meet eligibility criteria to go into labour after a previous caesarean. By helping remove systemic barriers to vaginal birth after caesarean, this research promotes informed patient choice and contributes to improved outcomes for mothers and babies by leading to reduced caesarean rates.	System: Knowledge dissemination—new policy

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
New provincial guidelines for the administration of the preventative drug palivizumab were published in JAMA Pediatrics. These guidelines are supported by collaborative research between scientists and clinicians at BC Children's Hospital that shows three to four doses of palivizumab protect at-risk infants from respiratory syncytial virus (RSV) as effectively as five doses. RSV is a common virus that infects the lungs and respiratory tract and can lead to life-threatening illness in vulnerable infants. The Canadian Pediatric Society recently revised their national guidelines for the administration of palivizumab in response these findings.	At-risk babies in BC now receive three to four doses of palivizumab depending on their individual risk level, rather than five. This new schedule reduces costs and means fewer painful shots for babies, without lowering the level of protection babies receive from the drug.	Patient: Protocols and guidelines System: Efficiency, cost/benefits or sustainability
The Concussion Awareness Training Tool (CATT) for School Professionals is now available for free online (www.cattonline.com). Researchers at BC Children's Hospital and the BC Injury Research and Prevent Unit in collaboration with GF Strong Rehabilitation Centre developed this evidence-based toolkit to help school professionals effectively prevent, recognize and respond to concussions in students. The tool consists of a 50-minute online course supported by downloadable documents including a checklist of learning accommodations for students with concussions and a plan for helping students return to the classroom following a concussion.	CATT promotes good concussion management to decrease the risk of brain damage and potentially reduce long-term health issues. The tool for educators will help school professionals prevent concussions during school activities, respond appropriately to concussions, and support students who have had concussions as they return to school.	Patient: Protocols and guidelines Patient: Improvements in timely access to care System: Process of care—standardization
The innovative Canadian Atlas of Child and Youth Injury Prevention (www.injuryevidence.ca) makes injury information and national, provincial and health authority-level data available in a visually appealing and user-friendly way. Researchers at BC Children's Hospital led the development of the Atlas and continue to populate it with updated data and research content. For ongoing sustainability, the Atlas is supported by Parachute, a national injury prevention partner organization.	The Atlas, the first of its kind in Canada, assists practitioners, policy-makers and researchers in making informed decisions that will improve child and youth injury prevention measures.	System: Knowledge dissemination—new policy

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
Researchers at the BC Injury Research and Prevention Unit at BC Children's Hospital have developed a validated indicator of severe pediatric injury to analyze changes in these injuries at a population level over time and to assess the performance of pediatric trauma systems.	This indicator can be used for the evaluation of trends in severe pediatric trauma, will help identify populations at risk and may inform policies and procedures for referrals of severe childhood injury to appropriate levels of care. The BC Government has adopted the severe pediatric indicator as one of BC's child health indicators (indicator #17).	System: Other type (improved metrics for evaluating health trends)
In 2016, the Community Against Preventable Injuries (preventable.ca) launched the "Seriously" mass media campaign through TV, radio, print and ambient messaging. The campaign ads show people at points of risk for injury being reminded about steps they can take to stay safe. The BC Injury Research and Prevention Unit at BC Children's Hospital is a Key Partner of the Community Against Preventable Injuries.	The "Seriously" campaign helps the public understand that many serious injuries are preventable through simple precautionary measures. Overall monitoring of the Preventable campaign shows a four to five per cent positive shift in attitudes and behaviours towards preventable injuries across the entire BC population. Those who have seen the campaign are significantly more likely to perceive injuries as preventable when compared to those who have not.	System: Knowledge dissemination—new policy
Injuries cost BC $3.7 billion in one year – that's over $400,000 an hour, according to the Economic Burden of Injury in British Columbia Report prepared by BC Injury Research and Prevention Unit at BC Children's Hospital. The report is based on the latest available data from provincial and national sources and also outlines the most common causes of injuries for different age groups. To support communities in injury prevention, the researchers produced the accompanying British Columbia Casebook of Injury Prevention, a how-to guide on injury prevention campaigns that includes examples of successful BC-led initiatives.	By highlighting where injury prevention efforts could have the greatest return on investment for all age groups, the report provides a key resource to help guide injury prevention initiatives across BC.	System: Knowledge dissemination—new policy

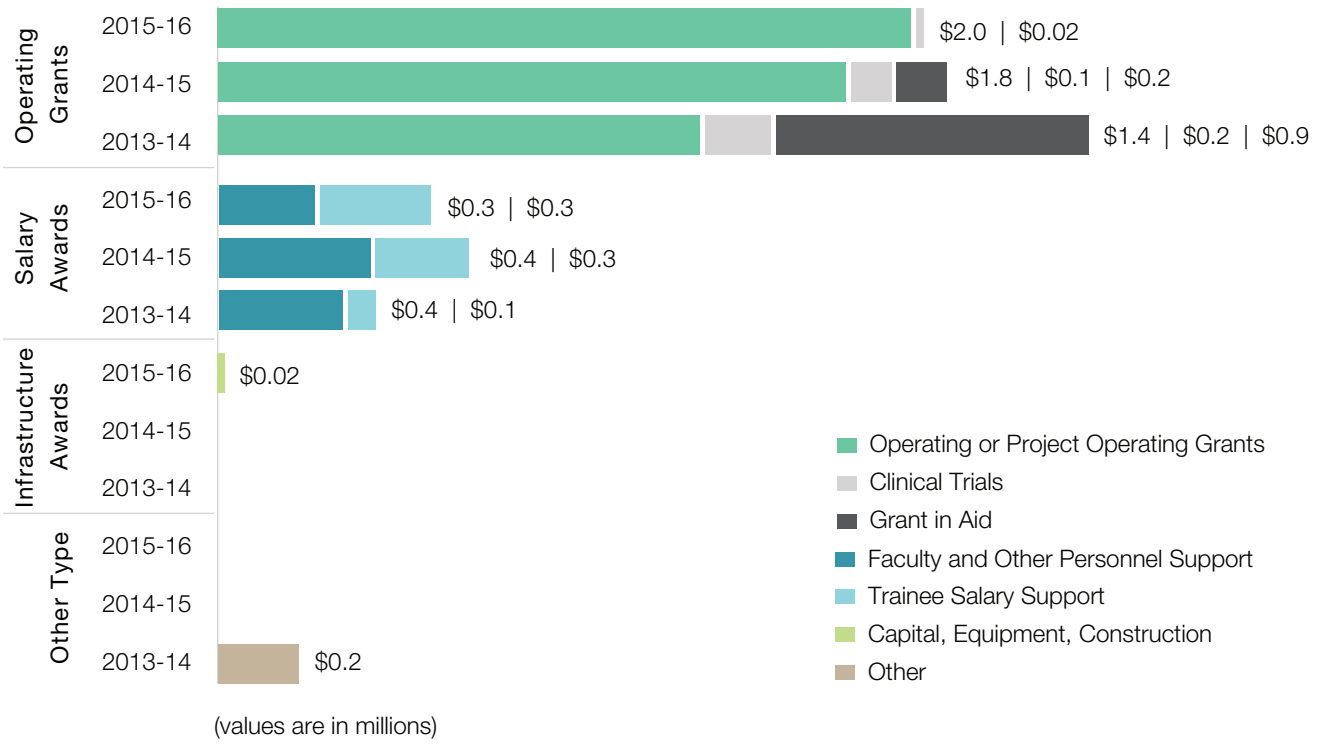
Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
CAUSES Research Clinic at BC Children's Hospital opened in fall 2015 and has begun diagnosing patients. CAUSES (Clinical Assessment of the Utility of Sequencing and Evaluation as a Service) is a research study to determine the clinical impact of genome-wide sequencing for children in BC with undiagnosed disorders. In addition to genome-wide sequencing, the clinic provides genetic counselling, interpretation of complex test results, personalized treatment recommendations, and access to improved services for children and their families. CAUSES will test at least 500 children and their families by 2018.	The state-of-the-art genome-wide sequencing offered at CAUSES allows doctors to identify genetic disorders that would have otherwise gone undiagnosed. In addition to providing answers for families, a diagnosis may open up new treatment possibilities, prevent additional invasive tests, reduce medical complications, and, in some cases, save lives.	Patient: Access to new treatment/technology Patient: Delay of disease progression/survival
BC Children's Hospital researchers discovered a new genetic disorder in two young men who have suffered a range of debilitating symptoms since birth. The findings were published in the Journal of Human Genetics. The condition is similar to a previously described genetic disorder called Weaver syndrome, for which CFRI researchers also found the causative gene in 2011. Both conditions are characterized by high birth weight, tall stature and developmental delays.	Children with this condition will now be able to receive a definitive diagnosis through genetic testing. This will help doctors develop a treatment plan and prevent unnecessary diagnostic tests. By advancing the understanding of the genetic causes of abnormal growth, this research may also lead to new insights about the molecular processes involved in the development of certain cancers, particularly leukemia, lymphomas and other blood cancers.	Patient: Delay of disease progression/survival Patient: Other type (directional research)
BC Children's Hospital researchers developed the iControl-RP device, which automatically adjusts anesthesia dosage based on the patient's brainwave activity and vital signs.	This personalized anesthesia delivery system makes anesthesia safer by ensuring patients receive enough medication to remain fully sedated, but not so much that they are at risk for complications. The new system is particularly important for children, who vary greatly in their responses to anesthesia drugs.	Patient: Access to new treatment/technology
In a study published in Nature Genetics, researchers at BC Children's Hospital found a genetic variation that brings a five times higher risk of heart damage for cancer patients treated with a type of chemotherapy drug called anthracyclines. Anthracyclines are a critical, life-saving treatment for leukemia, bone tumours and other cancers in both children and adults; however, in many patients, the drugs cause permanent heart damage that can lead to heart failure. Doctors in the Oncology Clinic at BC Children's Hospital are now using genetic testing to identify patients at risk for heart damage.	Genetic testing now allows clinicians to carefully consider modifying treatment for children who are at high risk of heart damage. Based on test results, the treatment team can weigh risks of drug toxicity against cure rate and involve families in decision-making to personalize treatment for their child.	Patient: Delay of disease progression/survival Patient: Access to new treatment/technology Patient: Other (risk evaluation to inform treatment choice and risk/benefit profile)

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
A study in Science Translational Medicine by scientists at BC Children's Hospital and the UBC finds that infants can be protected from getting asthma if they acquire four types of gut bacteria by three months of age.	This discovery opens the door to developing a preventative treatment for asthma, a potentially life-threatening disease that affects up to 20 per cent of children in western countries.	Patient: Other type (directional research)
Researchers at BC Children's Hospital and the UBC have found that special proteins called chemokines help keep our bodies' defenses in check by preventing the immune system from mistakenly harming healthy tissue. The study was published in the Journal of Clinical Investigation.	This discovery may help researchers develop new therapies that target the function of chemokines to prevent the unwanted immune attacks that cause disorders like type 1 diabetes and multiple sclerosis or lead to life-threatening organ rejection in transplant patients.	Patient: Other type (directional research)
A new blood test being developed by researchers at BC Children's Hospital and the UBC may help doctors monitor patients with type 1 diabetes (T1D), potentially leading to improved predictions about disease progression and more effective, personalized treatments. The study was published in Diabetes. The UBC has filed a provisional patent in the United States for the test panel, which measures regulatory T cells (Tregs), a type of immune cell that doesn't work properly in people with T1D.	This test may enable clinicians to provide more personalized treatment options by allowing them to determine which patients are most likely to benefit from therapies directed at Tregs. Until this test was developed, there was no easy way to track changes in Tregs in the body.	Patient: Delay of disease progression/survival Patient: Access to new treatment/ technology
In a study published in Gastroenterology, researchers at BC Children's Hospital have identified a new sub-type of inflammatory bowel disease (IBD) that can be treated with existing drugs that target the body's inflammatory response. In some children with IBD, an overactive protein called cytokine IL1 beta may be contributing to their symptoms. These children may respond to existing drugs that block IL1 beta, which are already in use for children with other immune conditions.	This discovery will allow clinicians to offer new options for children with IBD who aren't responding to current treatments. In addition to living with the life-disrupting effects of IBD, these children may face surgery to remove their colons, a procedure that can cause nutrient malabsorption and other lifelong complications.	Patient: Delay of disease progression/survival
A study in the journal Blood led by BC Children's Hospital researchers has identified a protein that could be used to diagnose chronic graft-versus-host disease (cGvHD), a serious, long-term complication that affects 30 to 50 per cent of patients after a blood and bone marrow transplant.	Currently, there is no test for cGvHD, and clinicians can only identify the condition when a patient develops symptoms. A diagnostic test for cGvHD would allow the condition to be treated earlier, before it becomes chronic and life-threatening.	Patient: Other type (directional research)

Producing and Advancing Knowledge

In FY 2015–16, researchers associated with BCMHSUS, were awarded a total of $2,651,677. Operating grants and Salary awards make up the majority (99%) of awards. A breakdown of funding types and subtypes can be found in Figure 33. BCMHSUS's portion of the Indirect Costs Program grant totaled $182,272 for FY 2015–16 but is not included in total research funding or the figures below.

FIGURE 33 **BCMHSUS Research Funding by Funding Type and Sub-type by Fiscal Year**



(values are in millions)

Figure 34 shows total awards by funding source category. The top two funding categories are Major Canadian Funding Entity (66%) and Canadian Foundations & Non-profit (28%).

Figure 35 details the major funding categories by RISe sector, funding source category and funding type.

FIGURE 34 Percentage of BCMHSUS Research Funding by Funding Source Category by Fiscal Year

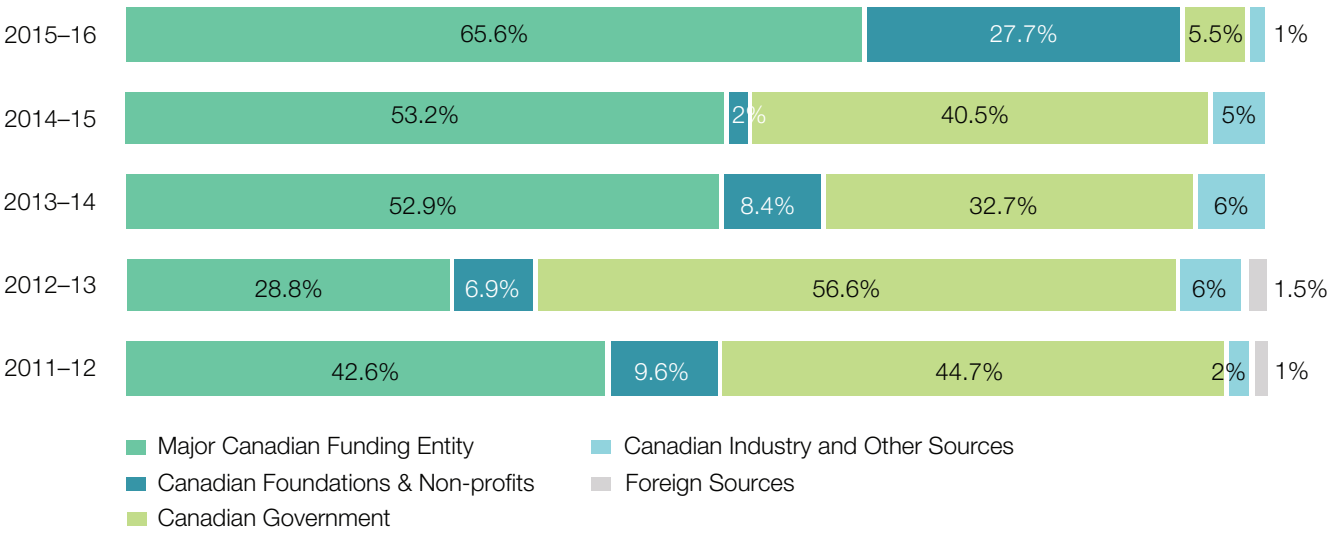
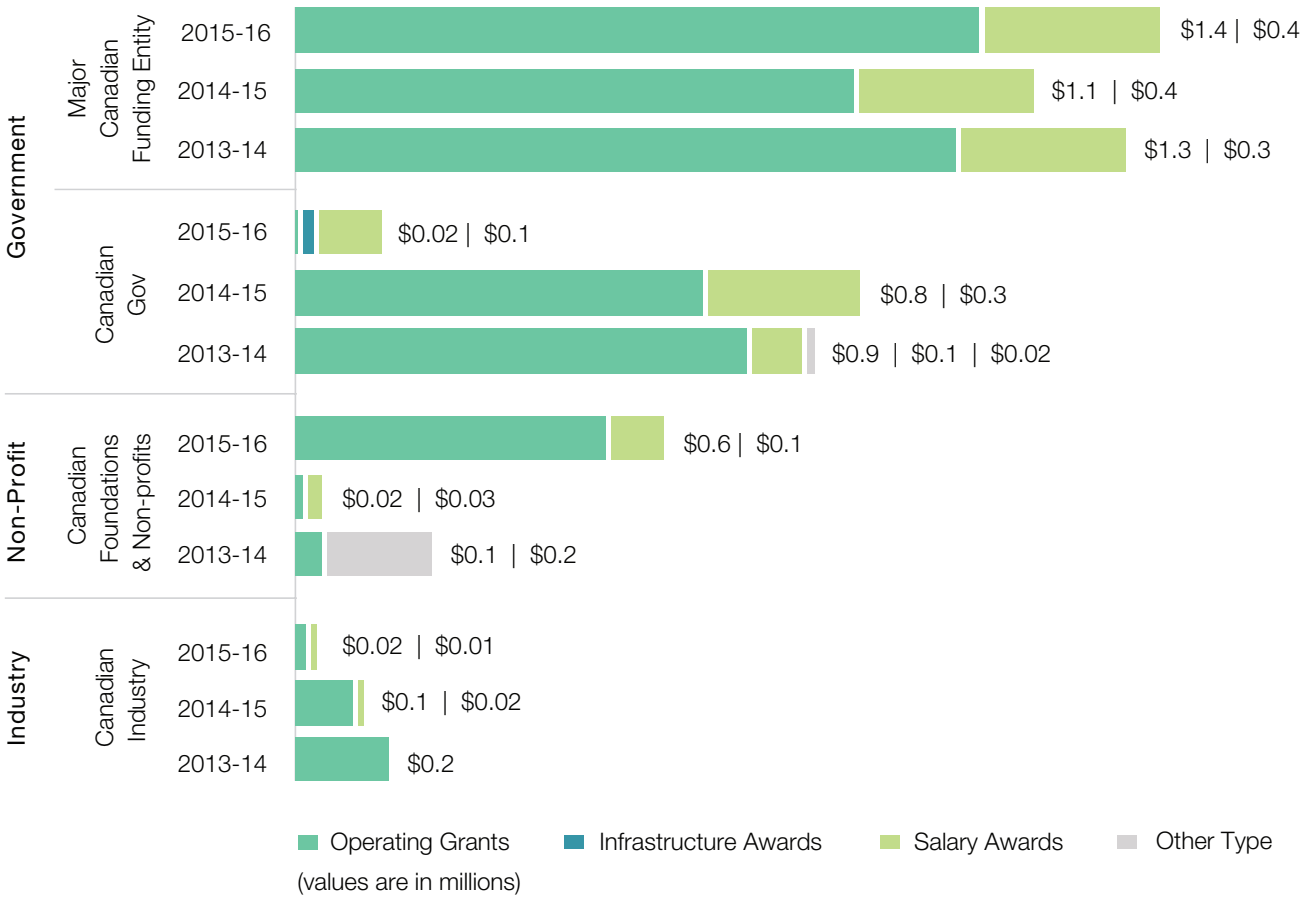


FIGURE 35 Total BCMHSUS Research Funding by RISe Sector, Funding Source Category and Type by Fiscal Year

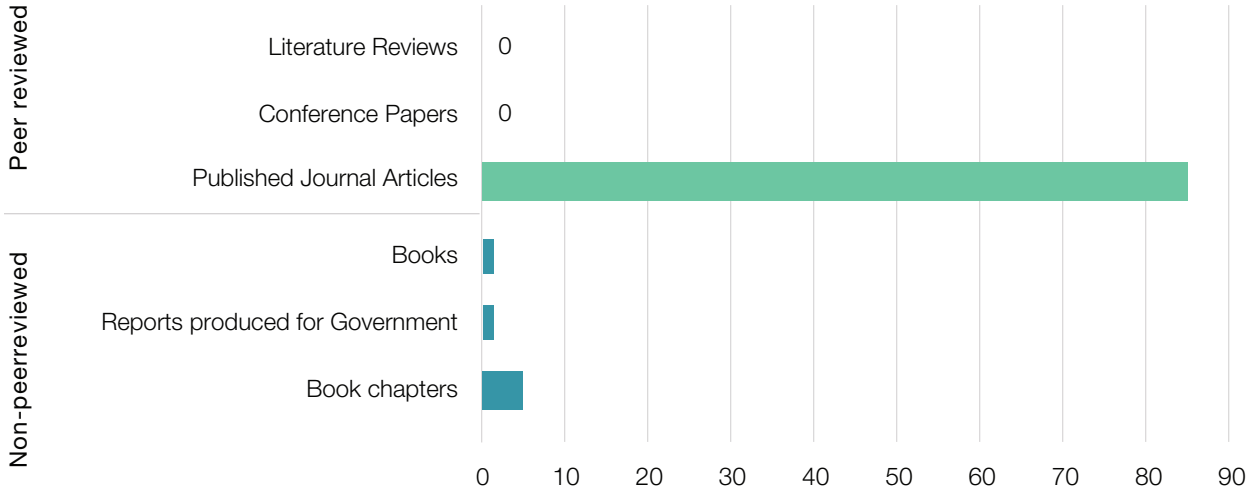


BCMHSUS has exceeded the national average in the CIHR Transitional Open Operating Grant Program (TOOGP) from March 2015. The March 2015 competition resulted in one approved applications and is in line when compared with historical figures for other Open Operating Grant Competitions. BCMHSUS received one approval from two submissions in the first Foundation Scheme Pilot. The table below shows CIHR grant application success rates for BCMHSUS compared to the national average as well as number of applications submitted and approved for the TOOGP.

Grant Funding Opportunity	Overall Success Rate % (Approved/Submitted)	UBC Success Rate % (Approved/Submitted)	BCMHSUS Success Rate % (Approved/Submitted)
TOOGP—March 2015	18.6% (500/2682)	13.6% (35/258)	33% (1/3)
Foundation Scheme Pilot #1	23% (150/467 stage 2–3)	23 approved	1 approved

BCMHSUS had a total of 95 publications in the 2015 calendar year of which 90% were peer reviewed. Total number of publications by type and category (peer vs. non-peer reviewed) is seen in Figure 36. The agency total represents the number of publications where at least one agency researcher was an author of the publication. When researchers from more than one research entity/agency collaborate on the same publication, it is counted once for each agency.

FIGURE 36 Total Number of BMHSUS Publications by Type and Category



Building Research Capacity

BCMHSUS had a total of 20 researchers in FY 2015–16, with 14 having greater than 30 hours or 70% protected research time per week (Figure 37). While this is a decrease from previous years, a number of BCMHSUS clinicians engaged in research are now counted in the CFRI totals following the operational transfer of Child & Youth Mental Health back to BC Children's Hospital.

During FY 2015–16, BCMHSUS researchers provided training and supervision to a total of 71 trainees. (see Figure 38).

FIGURE 37 Total Number of BCMHSUS Researchers by Category

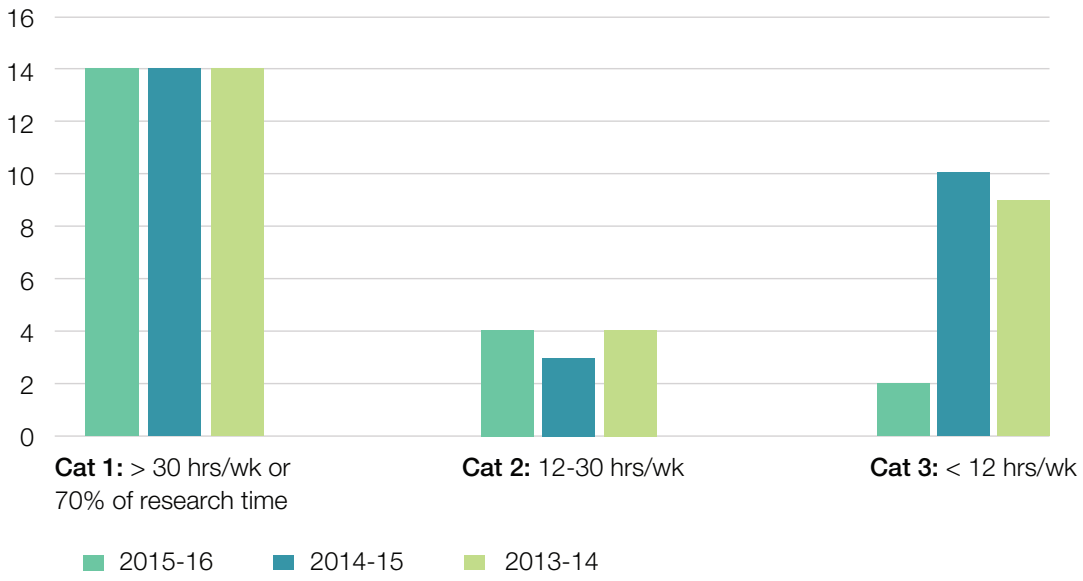
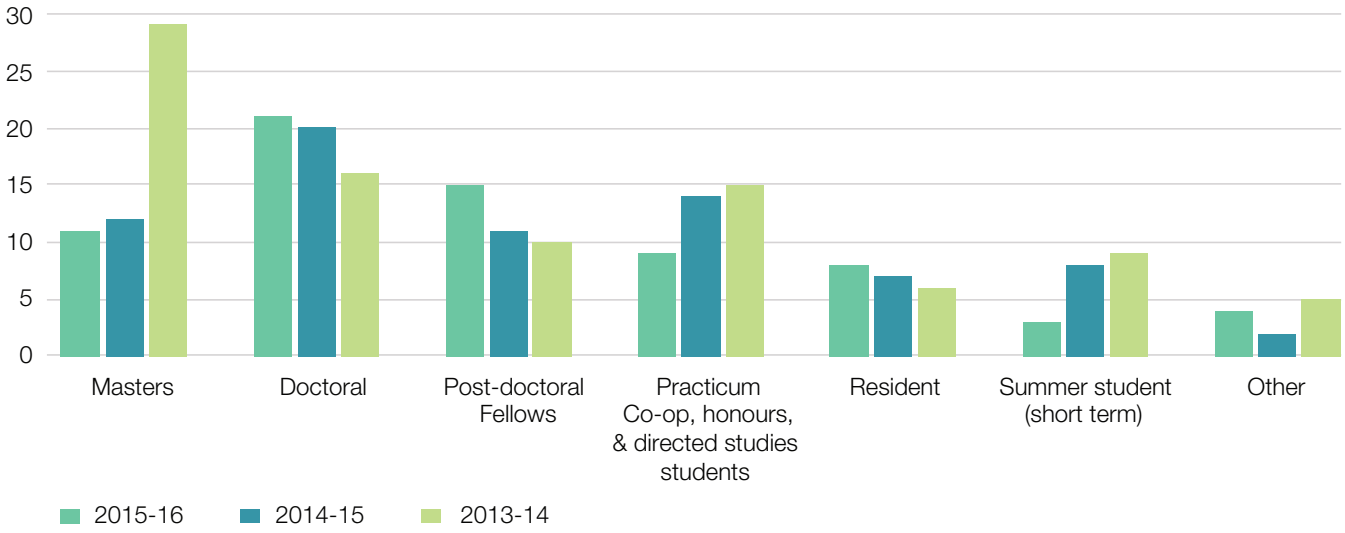


FIGURE 38 Total Number of BCMHSUS Trainees by Category



Advancing Health and Policy Benefits

See Table 9 for a detailed breakdown of clinical trial activity by fiscal year. Of note is that all of BCMHSUS trials contained enrollment figures in all REB records.

TABLE 9 BCMHSUS Clinical Trials

	11–12	12–13	13–14	14–15	15–16
Total Number of Clinical Trials active during the FY	9	10	7	5	4
Status of the Trial at the end of the FY:					
Total Number of Active Trials	9	10	7	5	4
Total Number of Trials that closed during the FY	6	5	2	0	0
Enrolment Numbers:					
Expected Local Subject Enrolment (for the term of the study)	618	828	688	563	640
Total Cumulative Subject enrolment at the end of the FY	323	16	56	77	228

Table 10 reflects a sample of key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2015–16 as a result of research driven by BCMHSUS researchers, and their corresponding benefits. These outcomes represent important achievements in translational research that are improving patient outcomes and system sustainability.

TABLE 10 BCMHSUS Outcomes Survey Responses

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
In 2015/16, BC Mental Health and Addictions Research Institute (BCMHARI) researchers published clinical trial results in schizophrenia (4), early psychosis (1), and in psychiatric genetic counselling (1). In addition, the results of meta-analyses related to schizophrenia were published (2).	Schizophrenia studies conducted by BCMHARI researchers indicated that there are limitations to the new technology, transcranial magnetic stimulation (TMS), which had been proposed as a treatment for auditory hallucinations. The trials showed that TMS was not successful in decreasing negative symptoms or in improving cognitive function in the illness. In contrast, the trials related to exercise interventions in schizophrenia and in early psychosis were very encouraging, and will contribute to guidelines regarding use of these strategies, and how they complement medication treatment, in the near future. The psychiatric genetic counselling trial clearly establishes this treatment as a novel intervention for decreasing stigma and increasing patients' understanding of illness. Meta-analyses indicated the limitations of existing evidence for fatty acid and vitamin supplements in mental illness, and supported the concept of using treatment response to clozapine to subtype this illness.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy System: Process of care—protocol implementation

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
BCMHARI investigators carried out studies and reported findings on patients treated with medications in programs with oversight or direct management by BCMHSUS. Seven publications resulted.	Studies reported new strategies to assess the value of different sites of drug injection for long-acting antipsychotics (4), and reported on side-effects or toxicities of prescribed and over the counter medications (3). These are important in risk management and ensuring patients receive safe, effective treatments.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy System: Efficiency, cost/ benefits or sustainability
The diagnosis of mental disorders is always a challenge, and requires specialist expertise in many situations. The presence of co-morbid illnesses (such as psychosis, addiction, and physical illness) is particularly challenging, and is a focus of BCMHARI investigators' publications (7), along with studies of young people with first episode psychosis (3).	These studies document at the community level the burden of illness and associated morbidities and mortality rates for co-occurring illness. BCMHARI studies are regularly cited by policy- and decision-makers at the metropolitan and provincial levels, in designing services and planning for the future.	Patient: improvements in timely access to care Patient: delay of disease progression/ survival System: Knowledge dissemination—new policy
New technologies in genetic testing allowing economical, high throughput tests (2), in protein biology allowing detailed study of the vast proteome (1), and with brain imaging to bring this work to the patient level (1) were carried out by BCMHARI investigators.	This work moves the application of genomics to personalized medicine forward to psychiatry. The protein work is one of the first applications of a mass spectrometry technique to schizophrenia brain samples, and complements work done last year using similar technologies in cognitive impairment. An analogous mass spectrometry technique was used with magnetic resonance imaging in patients, and holds promise for clinical application.	Patient: Access to new treatment/ technology System: Efficiency, cost/ benefits or sustainability
In response to an identified service gap for individuals with complex co-occurring disorders and associated behavioural challenges (e.g., violence, suicide, crime, repeated contact with police, emergency department visits), BCMHSUS was charged with improving the continuum of care for this population. The steering committee has developed the model of care, consulting on issues such as client descriptors, prevalence estimates, and the clinical plan. As part of the plan, a Clinical Leadership Group identified the need for clinical pathways to be developed that articulate a continuum of care for the Severe Addictions and Mental Illness (SAMI) population (through Emergency departments (EDs), stabilization units, tertiary beds, community ACT and mental health teams, and supported housing). Based on a systematic review (Nicholls et al. under review) the LOCUS was identified as the most appropriate measure for use in EDs.	BCMHSUS is leading an initiative with the five regional Health Authorities in British Columbia to provide training for the implementation of LOCUS as a standardized tool for use across the province. The plan is that the tool be used in Emergency Departments to guide placement of patients to tertiary psychiatry beds, and perhaps for community applications as well. LOCUS is being implemented across BC and will be used throughout the continuum of care to evaluate patient needs/bed levels and monitor progress among individuals with severe addictions and mental illness. The objective is to ensure that patients with the greatest needs have access to the appropriate services.	Patient: Improvements in timely access to care System: process of care standardization System: process of care—protocol implementation

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
(continued from previous page) In 2015, Dr. Nicholls consulted on the development of online training and case studies and will continue to support the implementation and evaluation. To date, 104 health care professionals from across BC have completed the online training on PHSA's web-based Learning Hub.		
In collaboration with key clinicians and decision-makers Dr. Nicholls is leading a program of work to systematically explore the trauma-related needs of patients and present practices in the Forensic Psychiatric Services Commission. Dr Nicholls and her students have presented their research findings to direct care providers and international audiences. She was subsequently invited to a Trauma Informed Practice (TIP) Steering Committee. The TIP Steering Committee was formed to provide leadership for planning, implementing, and evaluating a trauma informed approach to care and practice throughout BC Mental Health and Substance Use Services. The team's findings are being used to guide assessment, intervention, development and support a system-wide implementation and evaluation of gender-sensitive, trauma-informed services for the Forensic Psychiatric Services Commission. For instance, Dr. Nicholls has consulted on inpatient policies around seclusion, searches, and inpatient admissions to ensure that they are trauma-informed.	Individuals with mental illness and persons who come into conflict with the law present with disproportionately elevated rates of child abuse and violence and victimization across the lifespan. These events often have long-lasting and disabling effects (e.g., the capacity to trust care-givers). Individuals who have suffered trauma and violence are often unaware of the implications of those experiences for their mental health, substance misuse and associated adverse behaviours (e.g., suicidality, violence, crime, self-harm). As such, treatment and training are essential and in particular staff need to feel supported in ensuring that they have the necessary skill set to support victims of trauma and violence. The team's findings demonstrate that forensic psychiatric patients carry a greater burden of trauma than other institutionalized populations (inmates, tertiary patients). For instance, most patients report experience on average, more than 4 different types of childhood trauma, considered the tipping point for increased health risks and behavioural difficulties across the life-span. As such universal precautions are essential to prevent re-traumatizing patients and to provide services to patients with associated diagnoses, symptoms (e.g., PTSD, substance abuse) and behavioural challenges (aggression, self-harm) to reduce the risk of work-place violence/inpatient aggression, the need for seclusion, PRNs, etc.	System: updates to patient care protocols

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
A BCMHSUS researcher is first author on the Jail Screening Assessment Tool (JSAT), a manualized mental health screening program (i.e., assess mental disorder, suicide/self-harm, violence/ victimization). Supporting this work, there has been consultation on the implementation and evaluation of a two-tiered model for the new Toronto jail mental health program (>10,000 admissions/year), workshops offered to direct care providers (psychology, social work, OT, psych nurses) and consultation with the Centre for Addictions and Mental Health, ON on various clinical decisions (BPRS version, management recommendations following intake, consent) to guide the implementation. The research team is currently in discussions with the Correctional Service of Canada about a nation-wide implementation in federal prisons and a BCMHSUS researcher is part of the Canadian team leading an international initiative. The BCMHSUS research team has recently been invited to the 2nd stage of a CIHR funding competition for 2017 Networks of Centres of Excellence International Knowledge Translation Platforms (NCE-IKTP) competition to translate this program of work into international guidelines.	The JSAT is now used in every pretrial centre in Ontario (26 sites) and continues to be used in every pretrial facility in BC. The JSAT ensures that the inmate population which has a high prevalence of mental health needs is being systematically screened for mental health disorders using a reliable and valid measure. Screeners make recommendations for specialized placement (e.g., suicide watch, protective custody), referrals to mental health services (psychiatry, psychology) and health care. The objective is to prevent institutional violence and safety incidents (suicide, violence, victimization, self-harm) and expedite access to mental health care.	Patient: Improvements in timely access to care System: Process of care—protocol implementation System: Knowledge dissemination—new policy
In 2015/2016 the Short Term Assessment of Risk & Treatability (START) has continued to be supported throughout the Forensic Psychiatric Hospital and regional clinics. START continues to have a strong international presence, with over 5,000 manuals sold across Europe, Asia and North America. To date there have been greater than 40 publications about the START including a meta-analysis in 2014, and a comparative paper in 2016 in which START demonstrated predictive validity for inpatient aggression. START has been considered one of the most useful outcome measures in mental health and one of the most useful violence risk assessment tools. The Correctional Services of Canada has requested training for social workers, nurses, psychologists.	The ultimate objective of START is to prevent adverse events and support rehabilitation and community (re)integration of diverse inpatient and community populations (corrections inmates/prisoners, forensic and civil psychiatric patients). Reports supporting the reliability and validity of this tool may increase its uptake in appropriate populations.	Patient: Protocols and guidelines System: Process of care—protocol implementation System: Knowledge dissemination—new policy

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
The Short Term Assessment of Risk & Treatability-Adolescent Version (START-AV) Knowledge Guide was released in 2016. The team held a START-AV workshop at the International Association of Forensic Mental Health in June 2015. The measure has been implemented into practice internationally. For example, in the Netherlands it is being used in civil psychiatric inpatient practice, and there is interest in using it within child protection/foster care service. START:AV is being used in a juvenile justice setting in the US, Adolescent forensic mental health services in the UK, and residential treatment services/child protection services in the Yukon have also implemented the measure. The Ontario School Board has begun to utilize the measure. In Norway the measure has been used for several years (pilot testing began before the release of the manual) where the START:AV is used to provide comprehensive assessments and wrap around services with youth at risk.	The objective of the START-AV is to prevent adverse events (suicide, self-harm, violence, criminal offending, victimization) and support treatment planning for adolescent mental health populations, including for instance, civil mental health and juvenile justice populations.	Patient: Protocols and guidelines System: Process of care—protocol implementation System: Knowledge dissemination—new policy
A BCMHARI researcher has co-authored articles reviewing and explains the rationale for Metacognitive training/therapy (MCT). Metacognitive training/therapy (MCT) is a non-pharmaceutical intervention which has been shown to improve symptomatology and functioning in individuals with psychosis. It focuses on increasing the individuals understanding of the psychological mechanisms associated with delusions and hallucinations, and helping them develop strategies to improve reality testing and belief evaluation.	CIHR funding supports a five-year research study on the brain changes underlying MCT-based symptom improvement. This funding allows 2–3 treatment groups to be run per month in Vancouver. The novel access to MCT will improve patient quality of life through symptom reduction and will improve the quality of patient care by reducing medication side effects. Cost savings related to pharmaceutical use may also be realized.	Patient: Access to new treatment/ technology System: Efficiency, cost/ benefits or sustainability
In 2015/16, on-line training was launched for the START and the START-AV through a third party provider of online professional training, specializing in areas relevant to criminal and civil forensic mental health assessment, corrections, law enforcement and forensic intervention.	The ultimate objective of the START is to prevent adverse events and support rehabilitation and community (re)integration of diverse inpatient and community populations (corrections inmates/probationers, and forensic and civil psychiatric patients). Access to on-demand training to providers anywhere in the world may increase the update of these tools.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy

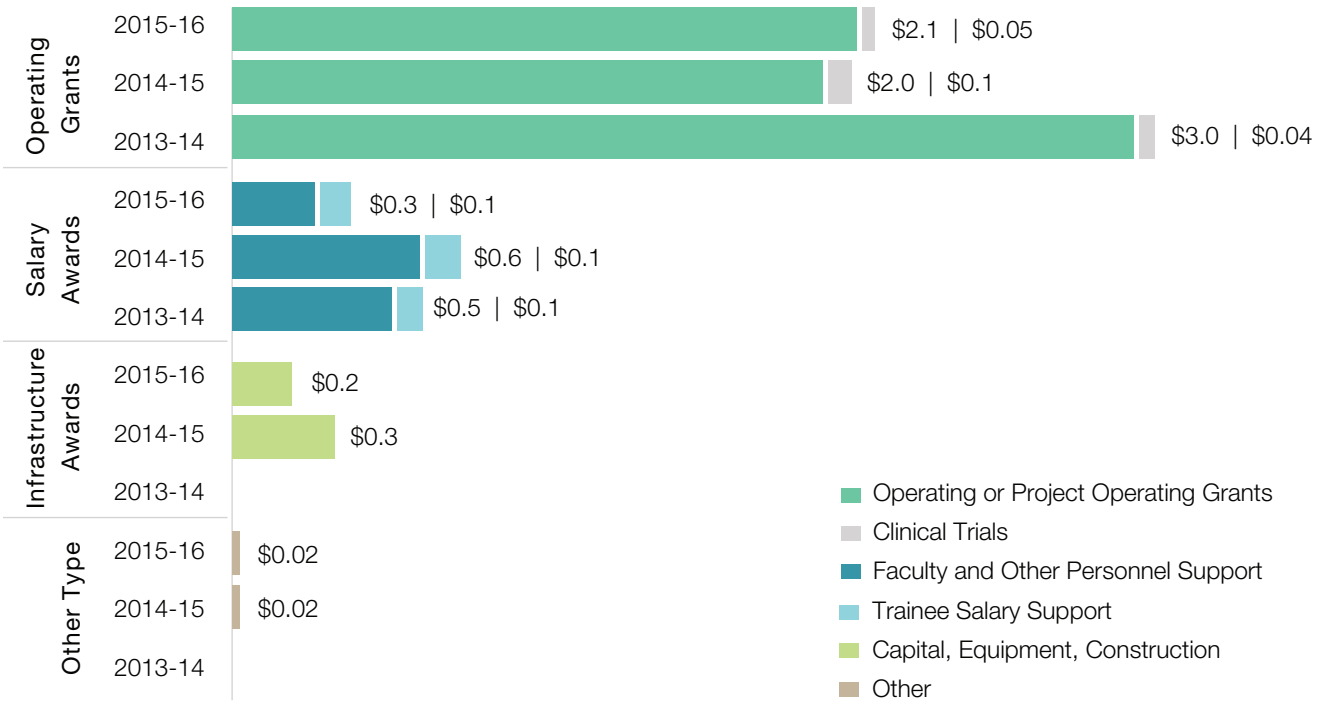
BC Centre for Disease Control

An agency of the Provincial Health Services Authority

Producing and Advancing Knowledge

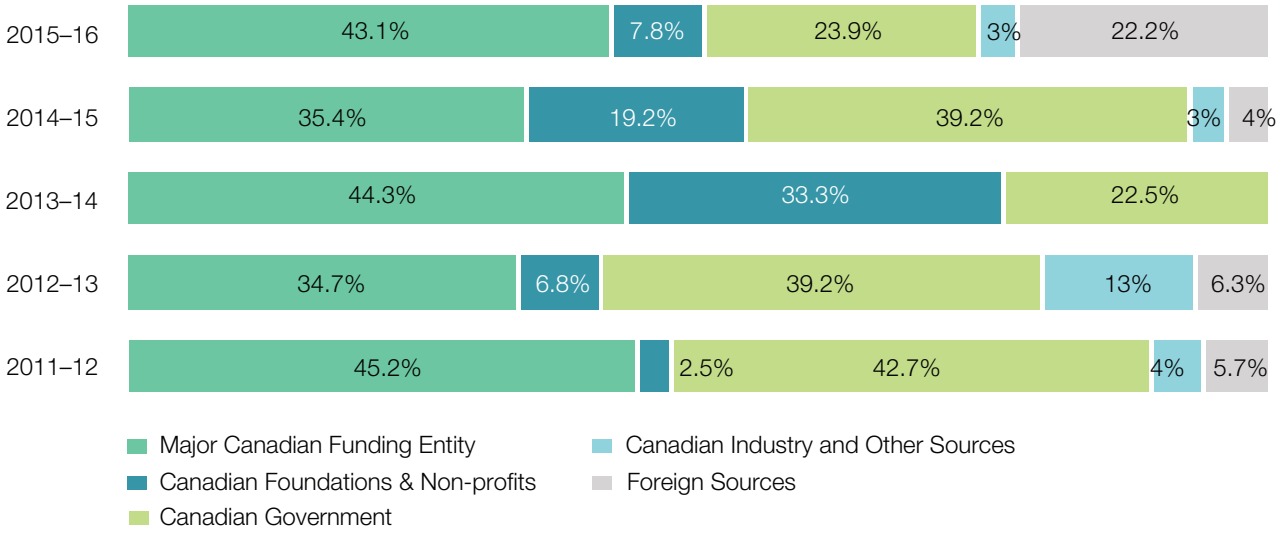
In FY 2015–16, researchers affiliated with BCCDC/UBC CDC were awarded a total of $2,713,324 in research funding. The amount awarded as Operating Grants ($2,119,488) makes up 78% of total awards. A breakdown of funding types and subtypes can be found in Figure 39 and by funding source category in Figure 40. BCCDC's portion of the Indirect Costs Program grant totaled $100,372 for FY 2015–16 but is not included in total research funding or the figures below. Because of its public and population health mandate, research at BCCDC is very much embedded within its clinical mandate and, as such, is also supported by operating funding to a significant degree.

FIGURE 39 Total BCCDC/UBC CDC Research Funding by Funding Type and Sub-type by Fiscal Year



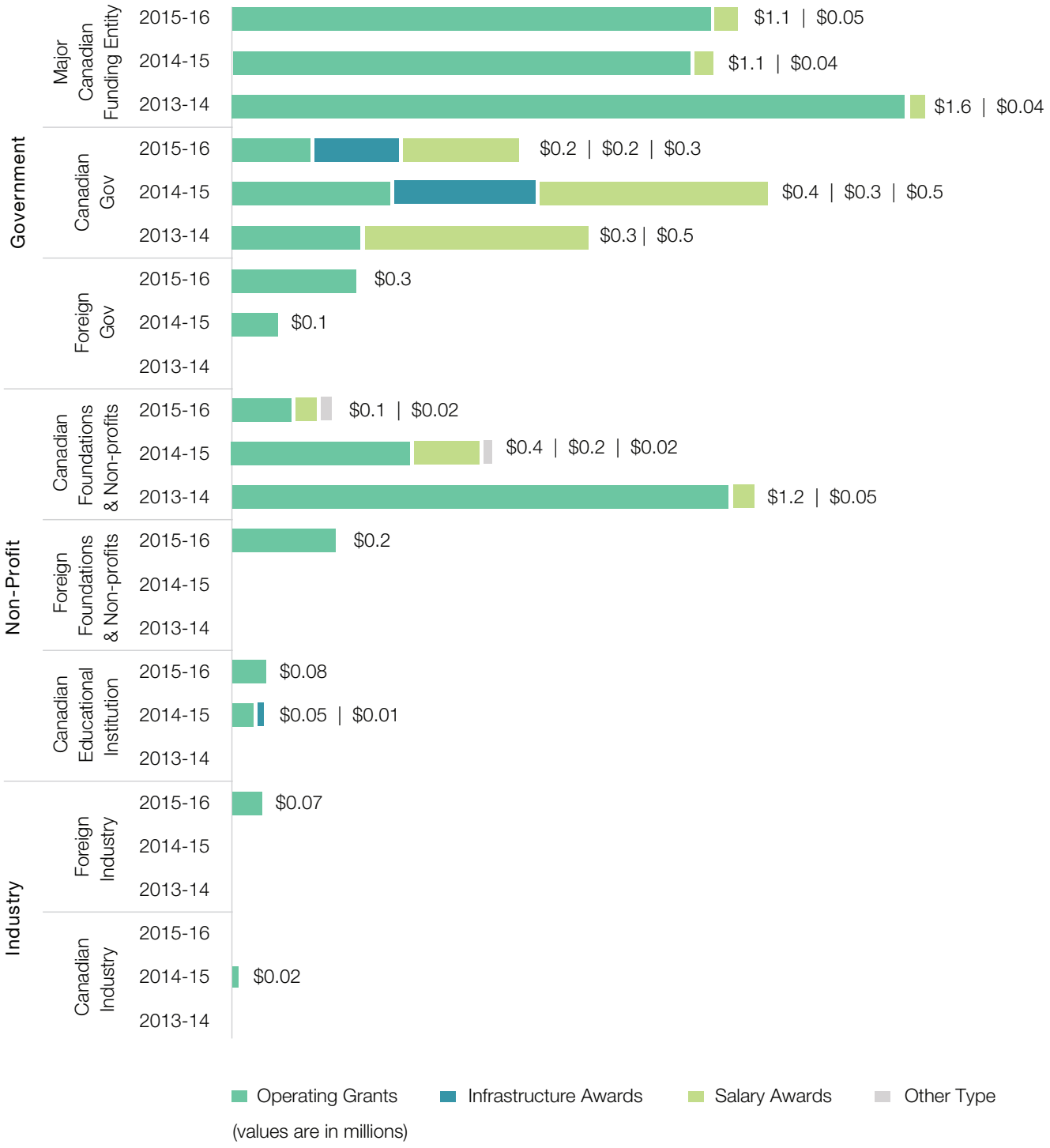
(values are in millions)

FIGURE 40 Percentage of BCCDC/UBC CDC Research Funding by Funding Source Category by Fiscal Year



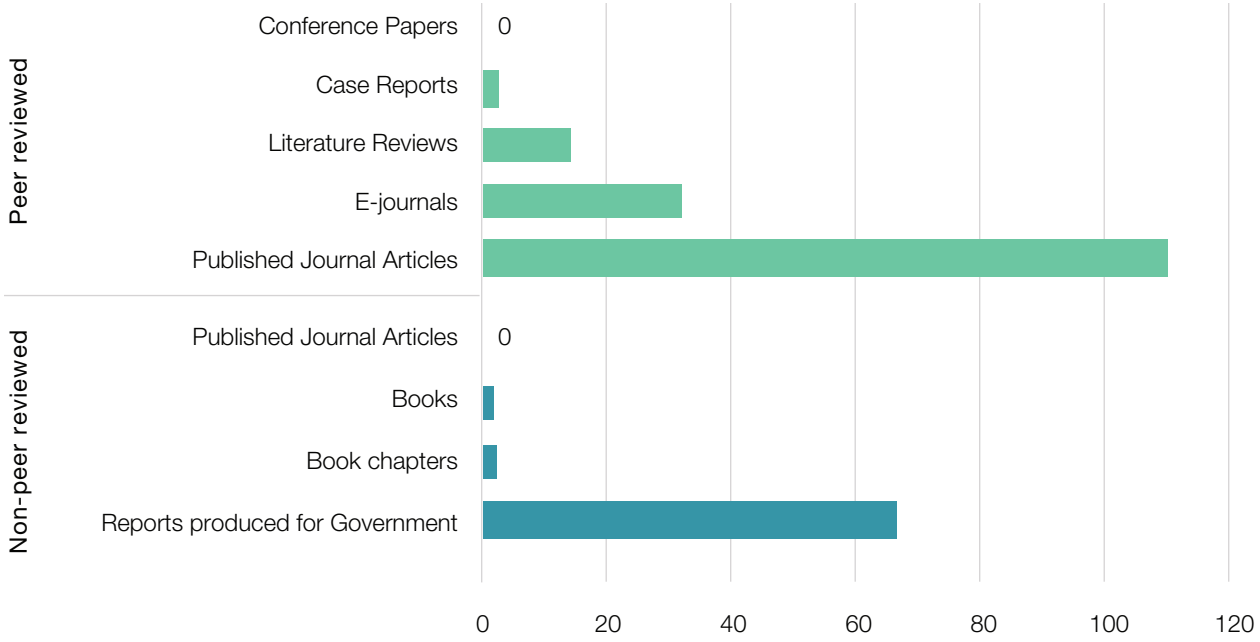
The top two funding categories are Major Canadian Funding Entity (43%) and Canadian Government (24%). Figure 41 details the RISe sector and major funding categories by funding type.

FIGURE 41 Total BCCDC/UBC CDC Research Funding by RISe Sector, Funding Source Category and Type by Fiscal Year



BCCDC had a total of 228 publications in fiscal year 2015–16 of which 69% were peer reviewed. Total number of publications by type and category (peer vs. non-peer reviewed) is seen in Figure 42. The agency total represents the number of publications where at least one agency researcher was an author of the publication. When researchers from more than one research entity/agency collaborate on the same publication, it is counted once for each agency.

FIGURE 42 **Total Number of BCCDC/UBC Publications by Type and Category**

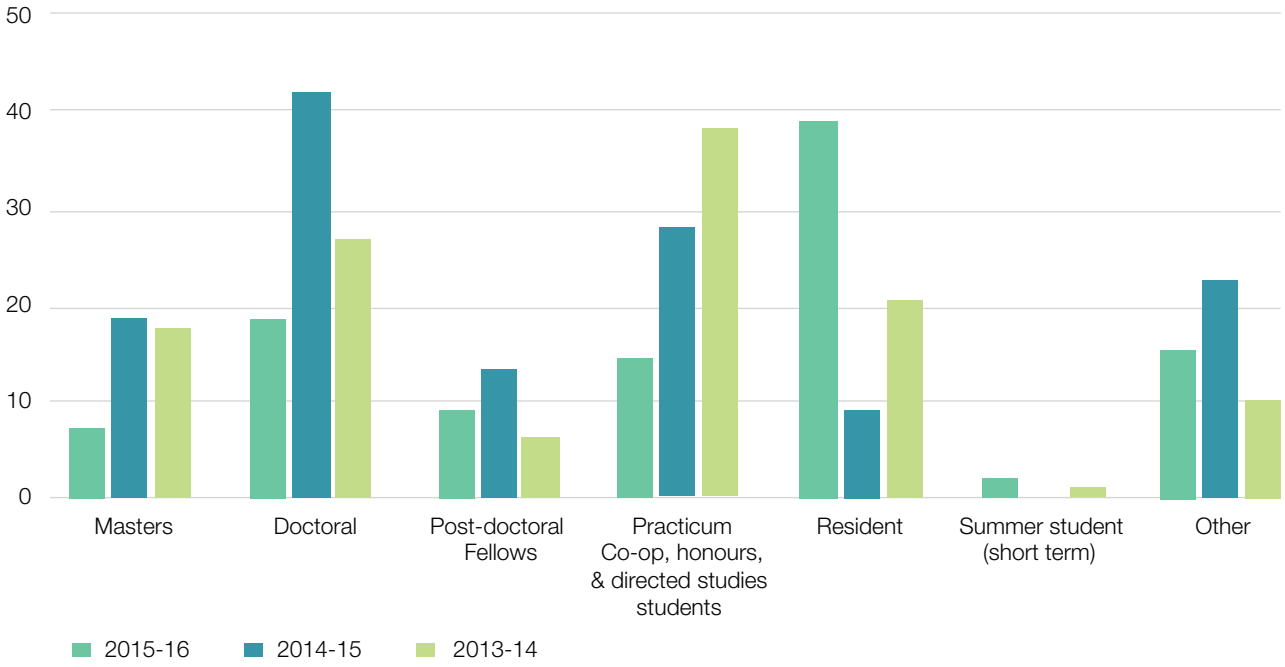


Building Research Capacity

BCCDC/UBC CDC defines a researcher as any principal investigator or co-investigator involved in BCCDC/UBC CDC research projects. BCCDC had a total of 34.5 researchers meeting this definition in FY 2015–16.

During FY 2015–16, BCCDC/UBC CDC researchers provided training and supervision to a total of 103 trainees (see Figure 43). The largest increase is seen in the resident category, however some variability results from the manual data collection process.

FIGURE 43 Total Number of BCCDC/UBC CDC Trainees by Type



Advancing Health and Policy Benefits

Clinical trial data from the REB is provided for a third year utilizing the same methodology as last year. See Table 11 for a detailed breakdown of clinical trial activity by fiscal year.

TABLE 11 BCCDC/UBC CDC Clinical Trials

	11–12	12–13	13–14	14–15	15–16
Total Number of Clinical Trials active during the FY	2	2	2	3	4
Status of the Trial at the end of the FY:					
Total Number of Active Trials	2	2	2	3	4
Total Number of Trials that closed during the FY	0	0	0	0	0
Enrolment Numbers:					
Expected Local Subject Enrolment (for the term of the study)	532	532	532	401	2,000
Total Cumulative Subject enrolment at the end of the FY	203	325	55	157	294

Table 12 reflects a sample of key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2015–16 as a result of research driven by BCCDC/UBC CDC researchers, and their corresponding benefits. These outcomes represent important achievements in translational research that are improving patient outcomes and system sustainability.

TABLE 12 BCCDC/UBC CDC Outcomes Survey Responses

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
The Bugs and Drugs guide to antibiotic prescribing was updated with input from PHSA and other researchers and is in broad use by clinicians throughout BC and AB.	Since adopting this guide, antibiotic prescribing is down about 15% in BC, mostly through lower rates of unnecessary prescribing.	Patient: Protocols and guidelines
BCCDC was the only North American site to participate in COMPASS-TB, an international consortium exploring whether the many parallel assays carried out in a mycobacteriology laboratory—diagnosis, speciation, resistance typing, genotype—could be replaced with a single whole genome sequencing (WGS) analysis.	The team showed that WGS could return the same results as traditional laboratory assays, but with dramatically faster turnaround times and at a lower cost.	System: Efficiency, cost/ benefits or sustainability
Guidelines for Testing, Follow-up, and Prevention of HIV	Revised guidelines support the practice of routine HIV testing and incorporates practice guidelines to detect acute HIV (evidence for this was based on research findings led by the BCCDC Public Health Laboratory and BCCDC Clinical Prevention Services).	System: Process of care-standardization
WHO vaccine strain selection for the southern and northern hemispheres: Recommendations for reformulation of influenza vaccine components for the southern hemisphere's 2016 influenza season (determined in September 2015) and the northern hemisphere's 2016–17 season (determined in February 2016), was informed by BCCDC-led research. The recommendations were based on research findings related to genetic, antigenic and epidemiologic monitoring of influenza vaccine-virus relatedness and effectiveness provided in September 2015 and February 2016 by the Canadian Sentinel Practitioner Surveillance Network (SPSN) [led by DM Skowronski of the BC Centre for Disease Control] to the WHO Vaccine Strain Selection Committee through the Global Influenza Vaccine Effectiveness (GIVE) consortium and published in numerous international journals including European Surveillance, PLoS One, and Clinical Infectious Disease.	Vaccine strain selection by the WHO to which the Canadian SPSN [led by BCCDC] determines the protection provided by vaccination to tens of millions of individuals globally in both hemispheres; as such the global influenza disease burden and its mitigation are influenced by findings provided by the BCCDC-led annual influenza vaccine effectiveness monitoring network.	Patient: delay of disease progression/survival; Patient: access to new technology; Patient: Other—reduced disease burden; System: Knowledge dissemination—new policy; System: resource improvements—workforce (vaccine protection influences absenteeism etc.).

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
Influenza antiviral drug treatment and prophylaxis guidelines for the 2015-2016 influenza season, published by the Association of Medical Microbiology and Infectious Disease Canada, were based on virologic and epidemiologic (vaccine effectiveness) findings provided by BCCDC-led research, and disseminated across Canada, December 1, 2015.	The update provided recommendations for optimal use of influenza antiviral treatment and prophylaxis mitigate the impact (morbidity, mortality and related health care utilization) of influenza outbreaks among those most vulnerable to serious influenza complications.	Patient: delay of disease progression/survival; Patient: protocols and guidelines; Patient: Other—reduced disease burden; System: Knowledge dissemination—new policy.
Updates to the Summary of Assessment of Public Health Risk to Canada Associated with Avian Influenza A (H7N9) Virus in China were made in April 2016 through the National Emerging Pathogen Task Group, of which a BCCDC researcher is a member, based in part on experience in BC, with the first importation of A(H7N9) to North America. Revisions to the guidelines based on that experience are currently being vetted by the Council of Chief Medical Officers of Health of Canada.	Updates to case definitions and surveillance protocols for response to importations of avian influenza A(H7N9) from China have significant implications for effective management of patients and for mitigating pandemic risks. Updated protocols improve early detection, containment and response to limit further spread of a dangerous pathogen with a high case fatality and considered a significant pandemic threat.	Patient: protocols and guidelines; Patient: Other—reduced disease burden and pandemic threat; System: Knowledge dissemination—new policy.
BCCDC, along with the Ministry of Environment, assesses risk to health arising from air pollutions, and, with the Regional Health Authorities (RHAs), advises the public of ongoing and immediate situations where air quality threatens health. As part of these efforts, BCCDC joined an international working group to develop consensus guidelines for public health decision-making during wildfire smoke events. With this work, a quantitative review of air quality advisories and Air Quality Health Index (AQHI) in BC was done to develop an early warning system for forest fire smoke impacts.	General population will now be notified of potential smoke impacts within the first hour, rather than waiting for 24 hours to pass.	System: Knowledge dissemination—new policy
BCCDC participated in an evaluation of the association between PM10 air pollution and health impacts in BC communities affected by road dust.	BC Ministry of Environment will keep the PM10 network running rather than immediately retiring the legacy instruments.	System: Knowledge dissemination—new policy
Province-wide surveillance of hot weather impacts conducted by BCCDC detected consistent effects in Cariboo-Chilcotin in 2014-2015.	Interior Health now planning for emergency response in this region during extreme hot weather.	System: Process of care-protocol implementation
The 2015 outbreak of Vibrio parahaemolyticus in BC, required shutdown of oyster industry and identified lack of readily available information on sea surface temperature. In response to the outbreak, BCCDC has put up information on their website.	Developed page for BCCDC website where satellite measurements of sea surface temperature are shown daily for all major oyster harvesting sites in BC.	System: Other type

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
BCCDC has implemented real-time surveillance of potential shellfish poisoning (a reportable disease) in calls to the BC Drug and Poison Information Centre.	Patients can now be contacted and followed by the local health authorities, which was not the prior protocol.	Patient: Protocols and guidelines
Provincial evaluation of timeliness of enteric disease surveillance led to changes in the processes to collect information from cases.	Improved timeliness of lab testing and sharing of epi and lab data.	System: Efficiency, cost/ benefits or sustainability
Completed Tick surveillance study in BC.	Data reassure low endemicity of Lyme disease in BC.	System: Knowledge dissemination—new policy
The personnel at the BC Drug and Poison Information Centre completed and published the 5th Edition of the Poison Management Manual. The Poison Management Manual is a compilation of monographs on the toxicity, clinical effects and treatment of frequently encountered poison exposures and drug overdoses commonly associated with a poor outcome. The format of each treatment monograph includes information on toxicity, pharmacokinetics, relevant case reports, clinical effects, and treatment guidelines. The manual is available in both an electronic version and a two volume 828-page print version.	The publication of this manual is a significant benefit to patients. It is available in hospitals in BC and copies of the monographs are provided when BCCDC provides consultations to medical practitioners who call the BC Drug and Poison Information Centre. The publication of these up-to-date guidelines ensures that when medical practitioners call the BC Drug and Poison Information Centre for consultation they can be provided with written guidelines describing the optimal management approaches.	Patient: Protocols and Guidelines

WOMEN'S HEALTH RESEARCH INSTITUTE AT BC WOMEN'S

Producing and Advancing Knowledge

In FY 2015–16, researchers affiliated with WHRI were awarded a total of $3,187,608 in research funding, which represents a 53% increase over last year. The amount awarded as Infrastructure ($1,803,954) and Operating Grants ($970,202) makes up 87% of total awards. A breakdown of funding types and subtypes can be found in Figure 44 and by funding source category in Figure 45. WHRI's portion of the Indirect Costs Program grant totaled $114,791 for FY 2015–16 but is not included in total research funding or the figures below. WHRI shares investigators with a number of other health research institutes and universities and benefits from additional external grant revenues linked to these investigators. At this time, those research dollars are only included if a formal transfer agreement is in place to allocate attribution of shared investigator grants. As a result, total research funding below is understated.

FIGURE 44 Total WHRI Research Funding by Funding Type and Sub-type by Fiscal Year

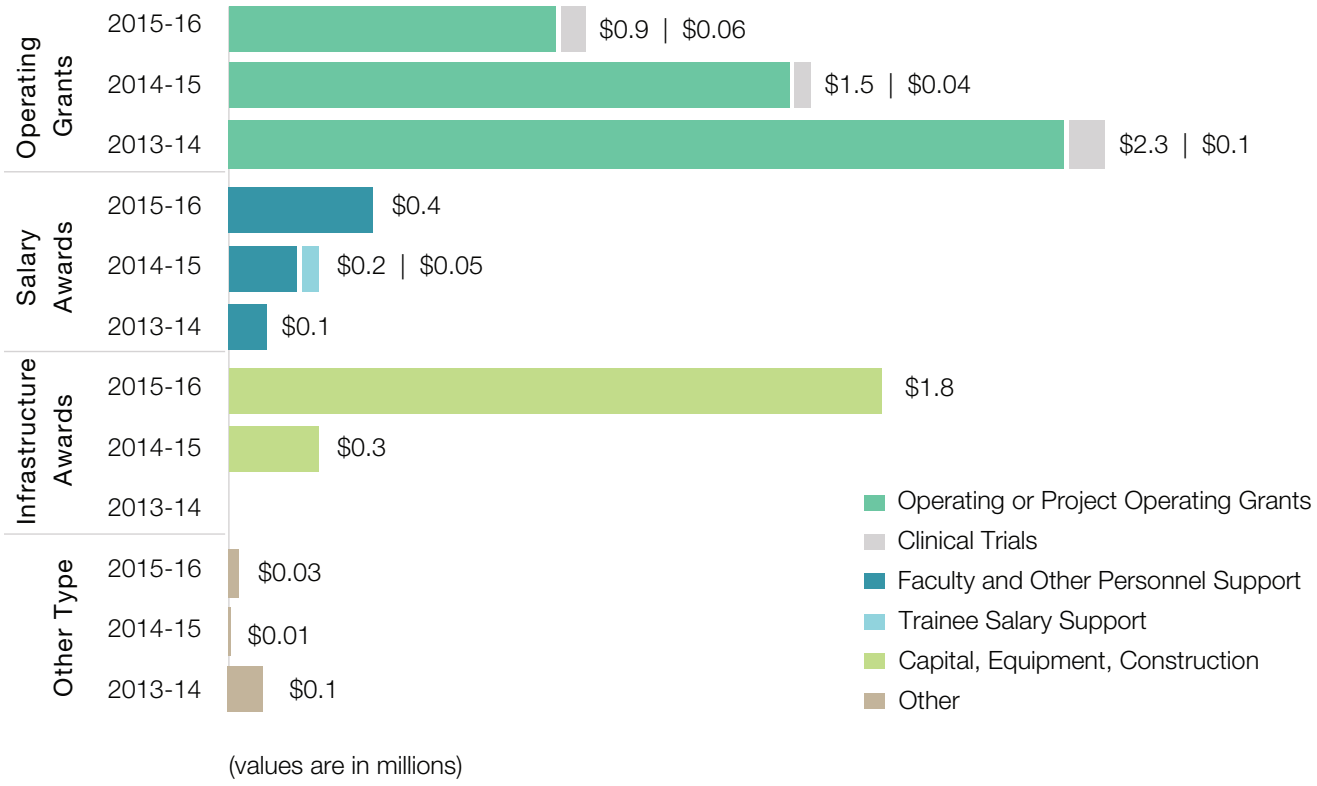
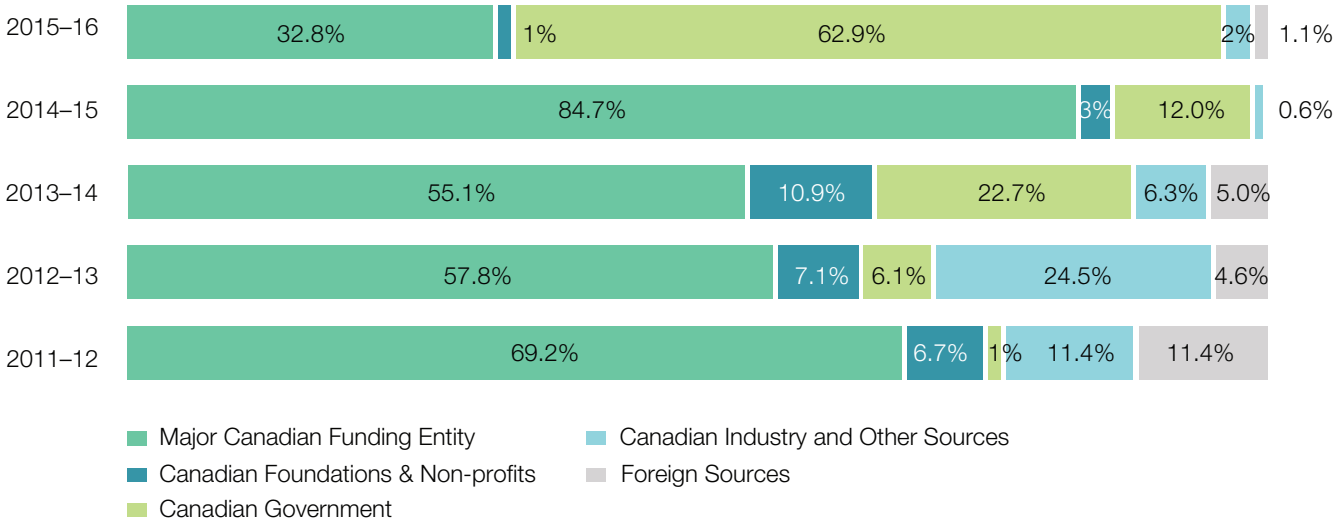
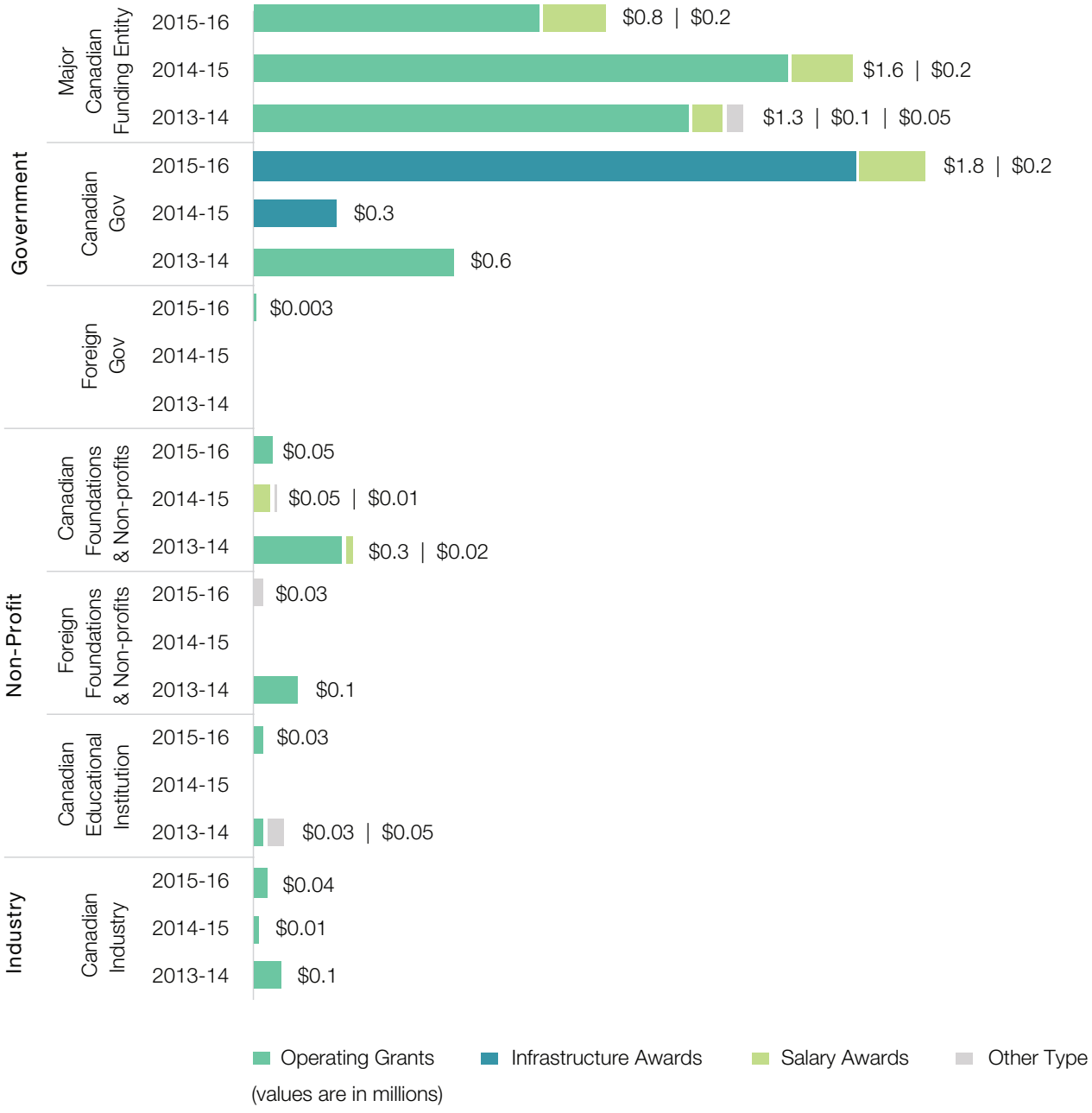


FIGURE 45 Percentage of WHRI Research Funding by Funding Source Category by FY



In FY 2015–16, the top two funding categories are Canadian Government (63%) and Major Canadian Funding Entity (33%). Figure 46 details the major funding categories by funding type.

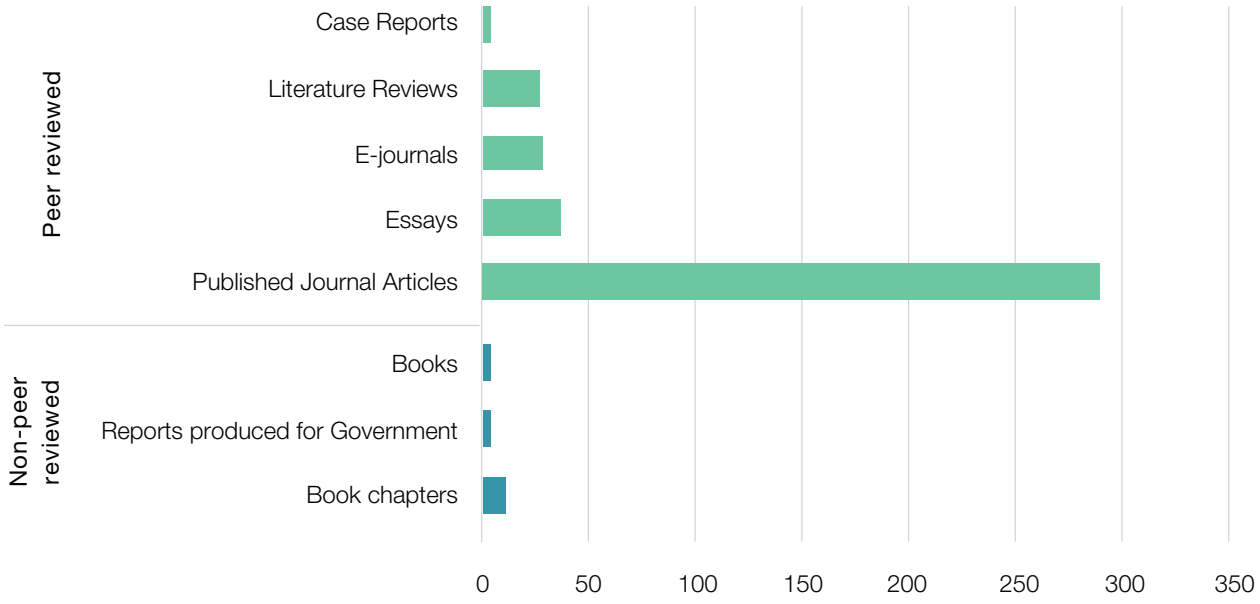
FIGURE 46 Total WHRI Research Funding by RISe Sector, Funding Source Category and Type by Fiscal Year



WHRI had two applications submitted in the Foundation Scheme Pilot #1 and a shared researcher with BCCDC, received one approval during the TOOGP in March of 2015. WHRI investigators apply for grant competitions that are offered by a variety of granting agencies.

WHRI had a total of 412 publications in calendar year 2015 of which 96% were peer reviewed. Total number of publications by type and category (peer vs. non-peer reviewed) is shown in Figure 47. Peer review represents the gold standard for scientific credibility. The agency total represents the number of publications where at least one agency researcher was an author of the publication. When researchers from more than one research entity/agency collaborate on the same publication, it is counted once for each agency.

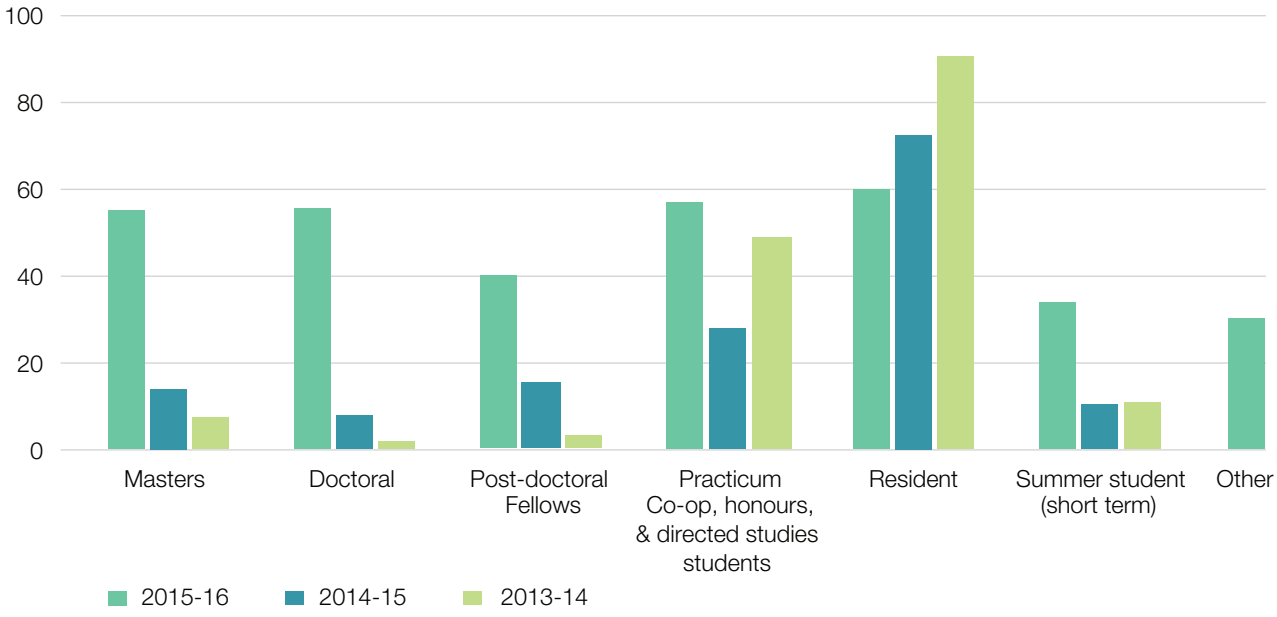
FIGURE 47 **Total Number of WHRI Publications by Type and Category**



Building Research Capacity

WHRI researchers provided training and supervision to a total of 332 trainees, a large increase over FY 2014–15 (see Figure 48). This increase is attributed to more accurate reporting of actual trainees plus the addition of new members who actively supervise trainees.

FIGURE 48 **Total Number of WHRI Trainees by Type**



In an effort to show WHRI's activities, their membership statistics are shown (see Figure 49). In FY 2015–16, the number of full members increased by three and associate members increased by ten. The membership categories are as follows:

Full Member	Individuals involved in women's health research for which the WHRI would be the only research institute affiliation.
Associate Member	Individuals who are involved in women's health research, at least in part, but have a strong relationship with another research institute (e.g. CFRI) that they wish to maintain; the result is a dual membership with the WHRI and their current affiliation.
Affiliate Member	Individuals who are extensively involved with another institute, but may have projects that would overlap with WHRI.

FIGURE 49 Total WHRI Membership by Category

Advancing Health and Policy Benefits

Clinical trial data from the REB is provided for a third year utilizing the same methodology as last year. See Table 13 for a detailed breakdown of clinical trial activity by fiscal year. Of note is that approximately 32% of WHRI trials had no enrollment figures. Once these fields are made mandatory as opposed too optional, enrollment figures should increase.

TABLE 13 WHRI Clinical Trials

	11–12	12–13	13–14	14–15	15–16
Total Number of Clinical Trials active during the FY	30	26	26	27	28
Status of the Trial at the end of the FY:					
Total Number of Active Trials	30	26	26	20	24
Total Number of Trials that closed during the FY	13	7	6	7	4
Enrolment Numbers:					
Expected Local Subject Enrolment (for the term of the study)	4,479	3,694	3,709	3,433	4,058
Total Cumulative Subject enrolment at the end of the FY	1,885	2,223	1,811	1,940	2,360

Table 14 reflects a sample of key guidelines, drugs, diagnostic agents, or devices adopted or approved in FY 2015–16 as a result of research driven by WHRI researchers, and their corresponding benefits. These outcomes represent important achievements in translational research that are improving patient outcomes and system sustainability.

TABLE 14 WHRI Outcomes Survey Responses

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
Based on evidence provided by a study lead by a WHRI researcher, BC has updated its provincial cervical cancer screening policy to recommend that women between the ages of 25 to 69 get tested every three years.	Improved heath for women due to evidence-based screening policies that have been shown to reduce women's risk of cervical cancer by 70%. Cost savings to the healthcare system due to reduced screening tests, as screening every three years was found to be just as effective and safe as screening every two years.	Patient: Delay of disease progression/survival; Protocols and guidelines System: Efficiency, cost/ benefit or sustainability; Knowledge dissemination—new policy
A WHRI researcher was the principal investigator of a study on childbirth in BC that led to the development of new scales which measure women's experience of communication with maternity care providers. These tools have been included in a World Health Organization global scan for novel instruments to assess quality and safety across high and low resource countries.	Improved maternal wellbeing due to the promotion of respect and autonomy for women's decision making in communication exchange with maternity care providers. Improved maternal and fetal health by assuring benchmark levels of maternity care quality and safety internationally.	Patient: Access to new treatment or technology System: Knowledge dissemination—new policy
A WHRI researcher was one of the lead authors on the Society of Obstetricians and Gynaecologists of Canada guideline relating to Medical Abortion.	This clinical practice guideline provides evidence-based regimens and special considerations for clinicians who provide medical abortion care for women with an unintended first trimester pregnancy. The guideline focuses on medical abortion (MA), that is the voluntary interruption of pregnancy through administration of one or more medications, over surgical abortion (SA), however, the pre-abortion section applies to both MA and SA.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy
A WHRI researcher was one of the authors of the national clinical practice guideline: Hypertension Canada's 2016 Canadian Hypertension Education Program Guidelines for Blood Pressure Measurement, Diagnosis, Assessment of Risk, Prevention, and Treatment of Hypertension	This updated guideline will lead to improved blood pressure screening due to evidence-based recommendations to guide the diagnosis, assessment, prevention, and treatment of hypertension.	Patient: Delay of disease progression/survival; Protocols and guidelines System: Knowledge dissemination—new policy

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
A WHRI researcher was one of the co-authors of a set of national clinical practice guidelines: Canadian Contraception Consensus (Parts 1–4).	These guidelines provide guidance to health care practitioners on the use of contraceptive methods to prevent pregnancy and on the promotion of healthy sexuality. The guidelines offer information on overall effectiveness, mechanism of action, indications, contraindication, non-contraceptive benefits, family planning in the context of sexual health and general well-being, Cost savings and increased patient safety by recommending the use of effective, low-risk methods of contraception.	Patient: Protocols and guidelines System: Efficiency, cost/benefit or sustainability; Knowledge dissemination—new policy
A WHRI researcher participated in the Maternal Fetal Medicine Committee that led to the development of the national clinical practice guideline: Guidelines for the Management of a Pregnant Trauma Patient.	Physical trauma affects 1 in 12 pregnant women and has a major impact on maternal mortality and morbidity as well as on the pregnancy outcome. The Guidelines provide care providers with an evidence-based systematic approach to pregnant trauma patients. This leads to improved maternal and perinatal outcomes due to optimal and uniform care for pregnancies complicated by trauma and improved public safety due to public health recommendations that aim to reduce accidental trauma in pregnant women.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy; Process of care—standardization
A WHRI researcher was the principal author of a national guidance document: Society for Obstetricians and Gynaecologists of Canada Committee Opinion on the Management of a Pregnant Woman Exposed to or Infected with Ebola Virus Disease in Canada.	This guidance document was developed in response to an outbreak of Ebola virus disease (EVD) in West Africa and outlines recommendations on the management of a pregnant woman exposed to or infected with Ebola. This Opinion attempts to prepare Canadian perinatal care providers with information on address the unlikely event a pregnant woman with EVD is seen in a Canadian setting, with the overall objective to improve public safety through the reduction of disease transmission in the event of a local outbreak.	Patient: Delay of disease progression/survival System: Knowledge dissemination—new policy; Process of care—standardization
A WHRI researcher participated in the Urogynaecology Committee that led to the development of the national clinical practice guideline: Obstetrical Anal Sphincter Injuries (OASIS): Prevention, Recognition, and Repair.	This clinical practice guideline improves outcomes for women who develop obstetrical anal sphincter injuries during the course of their labour and delivery due to evidence-based approaches to the diagnosis and repair of this obstetrical complication. In addition, there is increased patient safety due to better counseling regarding route of delivery for subsequent pregnancy after obstetrical anal sphincter injuries.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy; Process of care—standardization

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
A WHRI researcher led an international collaboration to develop the national guideline: Guidelines for the Implementation of Mother-Child Units in Canadian Correctional Facilities. These guidelines have resulted in the implementation of mother-child units in provincial correctional centers in BC and federal correctional facilities.	The implementation of mother-child units in Canadian correctional facilities will result in improved outcomes for infants of incarcerated women by preserving the process of bonding, breastfeeding and the development of close familial attachments.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy; Process of care—standardization
A WHRI researcher participated in the Genetics Committee that drafted the practice update: Technical Update on Preimplantation Genetic Diagnosis and Screening.	This technical update will educate clinicians about new preimplantation genetic concepts, directions, and technologies for the prenatal diagnosis of genetic disorders. This will result in improved perinatal and paediatric outcomes due to more accurate detection of genetic disorders in couples at risk of transmitting a genetic condition to their offspring.	Patient: Access to new treatment or technology; Delay of disease progression/survival System: Knowledge dissemination—new policy
A WHRI researcher was the principal investigator for two studies on mindfulness-based therapies for women with sexual dysfunction. These studies have led to the BC Centre for Sexual Medicine adopting a group treatment model as the standard of care at the for patients with these conditions.	Mindfulness is a form of meditation, defined as “paying attention, in a particular way, on purpose, in the present moment and non judgementally”. In adapting existing mindfulness-based psychoeducation (PED) to a group of women with sexual desire/interests and/or sexual arousal disorders, the studies found that it improved outcomes for women suffering from conditions of sexual dysfunction. In addition, there are cost savings due to care being delivered via a group treatment model versus a standard one-on-one therapy setting.	Patient: Access to new treatment or technology System: Efficiency, cost/benefit or sustainability
A WHRI/CFRI researcher led a study of the economic evaluation of home birth. These results have been used as testimony in the European Court of Human Rights and has also resulted in policy change in the Yukon Territories and in the province of Newfoundland.	The study found that there are cost savings through the promotion of an out-of-hospital birth setting. In addition, compared to hospital births, planned home births were found to be far less costly and just as safe for women who met the criteria for home births.	System: Efficiency, cost/benefit or sustainability
A WHRI researcher participated in the Clinical Practice-Gynaecology committee that led to the development of the national clinical practice guideline: Endometrial Ablation in the Management of Abnormal Uterine Bleeding.	Abnormal uterine bleeding (AUB) is the direct cause of significant health care burden for women, with up to 30% of women seeking medical assistance for the problem during their reproductive years. This guideline provides for improved outcomes for women undergoing endometrial ablation, a minimally invasive technique for the management of AUB, through the promotion of evidence-based clinical techniques and technologies.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy; Process of care—standardization

Please describe any guideline, drug, diagnostic agent or device adopted or approved in 2015/16 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit
A WHRI researcher participated in the Genetics Committee that led to the national clinical practice guideline: Prenatal Diagnosis Procedures and Techniques to Obtain a Diagnostic Fetal Specimen or Tissue: Maternal and Fetal Risks and Benefits.	Pregnant women identified as having an increased risk of a fetal genetic abnormality secondary to the process of established prenatal screen protocols may require or request counselling about pregnancy risks and benefits of an invasive ultrasound-guided procedure to determine the etiology, diagnosis, and/or pathology for the possible fetal anomaly. These guidelines aim to improve maternal and perinatal outcomes due to optimized risk/benefit counselling regarding pregnancy management decisions.	Patient: Access to new treatment or technology; Protocols and guidelines System: Knowledge dissemination—new policy; Process of care—standardization
Dissemination of knowledge translation materials on the Optimal Birth BC website, were developed on the basis of research supported by CFRI/WHRI.	This website will improve patient outcomes due to facilitation of evidence-based care and informed choice around vaginal birth after Caesarian section, with downstream impact of decreasing rates of Caesarian section in the province of British Columbia.	System: Knowledge dissemination—new policy
A WHRI researcher participated in the Genetics Committee that lead to the national clinical practice guideline: Pre-conception Folic Acid and Multivitamin Supplementation for the Primary and Secondary Prevention of Neural Tube Defects and Other Folic Acid-Sensitive Congenital Anomalies.	This guideline provides information to assist health care providers in educating women about the proper use and dosage of folic acid/multivitamin supplementation before and during pregnancy with the objective to improve maternal and perinatal outcomes and the prevention of neural tube defects and other congenital anomalies. Increased safety due to the recommendation to implement public health surveillance strategies to look for adverse health outcomes associated with folic acid supplementation.	Patient: Protocols and guidelines System: Knowledge dissemination—new policy; Process of care—standardization

REGISTRIES & DATASETS

Advancing Health and Policy Benefits

For a third year, data was collected from PHSA's registries and data sets to capture information to allow identification of users of the databases, how the data support research and a benefit classification which provides a deeper understanding of the benefits resulting from the use of these data for research.

Data stewards for a total of 14 PHSA registries or datasets, were invited to participate in a survey designed to assess the research activities of the registry/dataset. Completed surveys from 13 out of the 14 registries/datasets were obtained. The Research Metrics working group drew a distinction between two types of databases that might be counted. The first are those that serve as registries. These are the result of significant infrastructure investment in the collection of longitudinal data that are regional, provincial or national in scope regarding provision of services to specific population(s), maintained for the purposes of undertaking analysis, surveillance and/or research. They represent a significant resource for and investment in research. The second (not collected) are short-term, project-related databases that are primarily grant funded and are not maintained for use beyond the term of a given research project.

Registry/data set Definition/Purpose

The information on each registry/dataset was compiled from online resources and is described below.

Registry/Dataset	Purpose
BC Cancer Registry	The BC Cancer Registry is a population-based registry of all cancers diagnosed in British Columbia residents. It collects data and generates cancer statistics on the BC Population for the purpose of monitoring the burden of cancer in the province. It also serves as a source of information for research.
BC Cardiac Registry (HEARTis)	Heart Information System (HEARTis) tracks a patient journey for all current and future cardiac procedures, throughout British Columbia, from registry on the waitlist to procedure completion and follow up. Its purpose is to support clinical care, quality assurance and improvement, and outcome-based research.
BC Perinatal Database Registry (BCPDR)	The (BCPDR) contains data abstracted from obstetrical and neonatal medical records on nearly 100% of births in the province of British Columbia from over 60 hospitals as well as births occurring at home attended by BC registered midwives. The BCPDR also collects data on maternal postpartum readmissions up to 42 days post-delivery and baby transfers and readmissions up to 28 days after birth. Data access is provided for public-interest research purposes, surveillance, program delivery, and evaluation.
BC Trauma Registry	Provides data collection, reporting and support of research and quality initiatives related to trauma care.

Registry/Dataset	Purpose
BCCH's Biobank	The mission of the BCCH BioBank is to provide a comprehensive service for the collection, processing, storage, rapid access and retrieval of biospecimens and clinical information for research projects using a professional and compassionate approach to patient consenting that adheres to the highest standards of research ethics and patient privacy. A single biospecimen from one patient has the ability to fuel numerous research projects, any one of which might lead to an important medical breakthrough. BC Children's Hospital BioBank collects samples from patients at both BC Children's Hospital and BC Women's Hospital.
Cervical Cancer Screening Database	A population based clinical system for cervical cancer screening as well as a lab system for all gynaecological cytology performed by the Provincial lab.
PREDICT	PREDICT—Personal Response Determinants in Cancer Therapy is a unique centre-wide research project that has embedded a research culture into the day to day clinical care activities of the BC Cancer Agency's Vancouver Island Centre (VIC). The goals of PREDICT are to: 1. Create a population-scale biobank of blood samples obtained prior to initiation of systemic therapy from 20,000 new cancer patients; 2. Obtain permission from all new patients to be contacted to participate in future research projects, overcoming ethical and logistical hurdles to translational health research; and 3. Engage 75% of new patients and staff at the VIC in a common research endeavor that changes the culture of a cancer centre. PREDICT provides a unique platform to support specific research into host factors, such as the patient's immune system and adverse reactions to therapy, that influence the outcome of cancer therapies.
PICNET	Provincial Infection Control Network of BC's aim is to to reduce healthcare-associated infections in BC healthcare facilities. Key areas of focus are surveillance, evidence-based guidelines, and education.
PROMIS—BC Renal Agency/BC Transplant	Patient Records and Outcome Management Information System—is the renal care community's clinical information system. With data collected from the 39 renal units in British Columbia, PROMIS supports: Individual patient care management; Renal unit management; Continuous quality improvement and research; Outcomes-based planning. PROMIS database is used as a source of important epidemiological data in support of clinical trials and for assessing new therapies.
Screening Mammography Database (SMP)	Clinical system for scheduling, reporting and tracking of screening mammography exams.
BCEHS Resuscitation Outcomes Consortium (ROC)	The Resuscitation Outcomes Consortium (ROC) was created to conduct clinical research in the areas of cardiopulmonary resuscitation and traumatic injury. ROC consists of 10 Regional Clinical Centers (RCCs), one satellite site and a Data and Coordinating Center (DCC) that will provide the necessary infrastructure to conduct multiple collaborative trials to aid rapid translation of promising scientific and clinical advances to improve resuscitation outcomes.
Surgical Patient Registry (SPR)	SPR is a provincial program involving the five regional Health Authorities, the Provincial Health Services Authority (PHSA) and the Ministry of Health (MoH). SPR tracks patients waiting for surgery in British Columbia and provides information to evaluate and monitor surgical wait times in the province.
Tumour Tissue Repository (TTR)	TTR is a provincial resource to support translational cancer research at the BCCA, across Canada and internationally. The TTR is a state of the art tumour bank that collects tissues, blood, and clinical information and processes these to create anonymous cases that can be studied by cancer researchers to understand how cancer develops, how it grows, how it spreads, and how it responds to treatment.

Supporting Research Activities

For FY 2015–16, ten out of the 13, or 77% of registries/datasets are used for the purpose of research as defined by UBC (see Glossary, page 93). In addition, respondents were asked to identify other activities they provide in support of research.

Table 15 lists the support activities by registry/dataset and shows the number of times in the past three fiscal years that a registry has provided a particular support activity. These research support activities are ranked from most provided to least over the three-year period.

TABLE 15 Research Activities Supported by Registries and Datasets

Research Support Activity	Cancer	Cardiac	Cervical	Perinatal	PICNet	PREDICT	Renal	SMP	SPR	Transplant	Trauma	TTR	Biobank	BCEHS/ROC	Grand Total
Support in managing and linking data	3	3	3	1		2	2	3	3	2	2	3	1		28
Support in designing research studies	3	3	2	3		3	2	3	1	1	1	3	1	1	27
Facilitate communication to identify pertinent research question		3	3	3	2		2	3	3	2	3				24
Support in ensuring studies meet regulatory standards	2	2	2	3		2	2	3	2		1	3		1	23
Assist in identifying knowledge gaps and improvement needs	1	3	3	3	2		2	3	1	2	3				23
Support in conducting biostatistical analysis	1	3	1				2	3	2	1	2			1	16
Provide specialized and multidisciplinary methodological expertise	2	2				2	2		1	1		3		1	14
Application of new technical capabilities to provide more timely access to wider range of data		2		1			2		1		2		1		9
Teaching and hands on training for the above				1		2	1					3		1	8
Other	2					1							1		4
Support in providing and teaching project management skills							1								1
Not used to support research					1										1
Grand Total	**14**	**21**	**14**	**15**	**5**	**12**	**18**	**18**	**14**	**9**	**14**	**15**	**4**	**5**	**178**

Respondents were asked for a third time this year if they submit data to external organizations for the purposes of research. See Table 16 for the breakdown of data set type by registry/dataset for FY 2015–16. Table 16 lists the type of external data set and shows the number of times in the past three years that the registry has submitted data. The type of dataset is ranked from most submitted to least.

TABLE 16 Provision of Data to external Data Sets by Registry

Type of External Data Set	Cancer	Cardiac	Cervical	Perinatal	PICNet	PREDICT	Renal	SMP	SPR	Transplant	Trauma	TTR	Biobank	BCEHS/ROC	Grand Total
Pan Canadian dataset	3						1	3	2	2	2	3			16
Cross feeding within PHSA	2	2		1			2		1	1	1				10
International dataset	3						1			2				1	7
Provincial data		2					1		1						4
Other	3	1		3		1					1				9
Data Not Submitted to Any Organization		1	3		3	1							1		9
Grand Total	**11**	**6**	**3**	**4**	**3**	**2**	**5**	**3**	**4**	**5**	**4**	**3**	**1**	**1**	**55**

Names of the external datasets include:

Provincial:
- ICV Health—BC Centre for Improved Cardiovascular Health
- Surgical Patient Registry (SPR) Completed Surgical Cases
- Population Data BC
- Statistics Canada
- First Nations Client File—Ministry of Health

Pan Canadian:
- Canadian Cancer Registry
- Canadian Organ Replacement Registry (CORR)
- Public Health Agency of Canada (Canadian Breast Cancer Screening Database)
- National Trauma Registry
- Pediatric Trauma Care Quality Indicators—London Health Sciences
- Canadian Joint Replacement Registry—CIHI
- Canadian Tumor Repository Network (CTRNet)

International:
- North American Association of Central Cancer Registries (NAACCR)
- International Agency for Research on Cancer (IARC—a division of the World Health Organization)
- International Society for Heart & Lung Transplant (ISHLT)
- Resuscitation Outcomes Consortium (RoC)*

*ROC include 4 distinct data sets; Cardiac Clinical Trials, Trauma Clinical Trials, Cardiac Arrest Registry and Trauma Registry.

Nature of Research Activities

CIHR (Canadian Institutes of Health Research) categorizes health research into four broad themes: biomedical research, clinical research, health services research (research respecting health systems and services); and social, cultural, environmental and population health. Research pursued using the registries/datasets above are categorized in Figure 50. Access requests are summarized in Figure 51.

For examples of the types of research questions posed by researchers, please see Appendix 1.

In addition, BCEHS manages two distinct data sets for ongoing research; King Airway and the Red Blood Cell Products Pilot Project. BC Emergency Health Services is mainly a health service delivery agency whose mandate includes the production of knowledge in the patient populations they serve.

FIGURE 50 Ranking of Predominant Nature of Research Questions Using Data from the Registries/Datasets

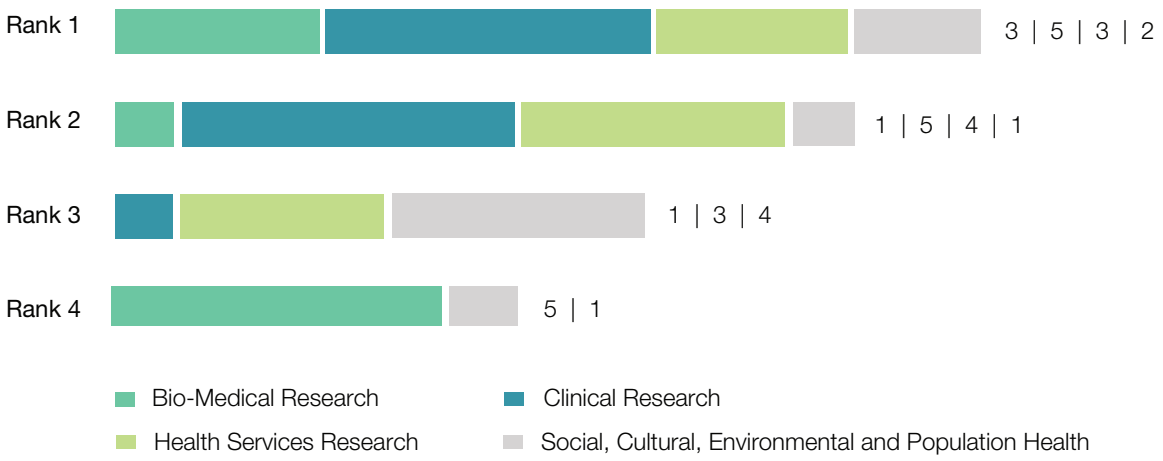
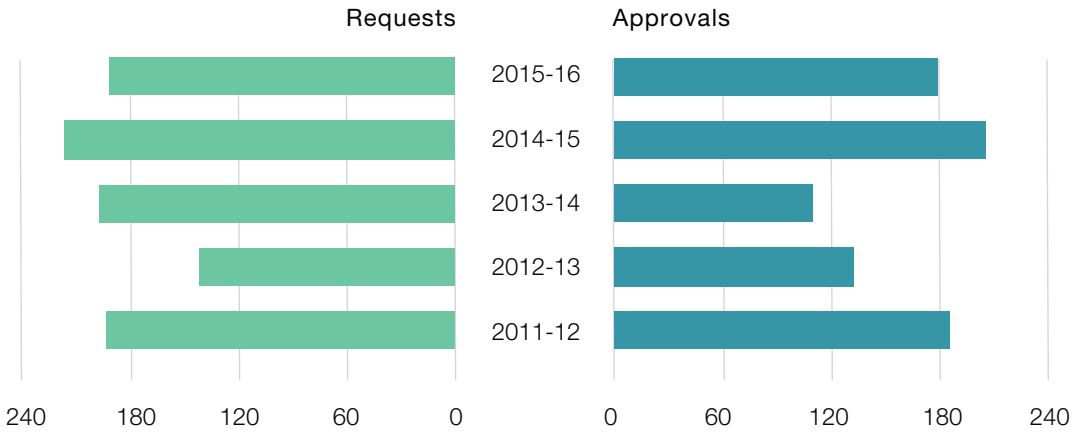


FIGURE 51 Research Access Requests and Approvals from Registry/Dataset by Fiscal Year



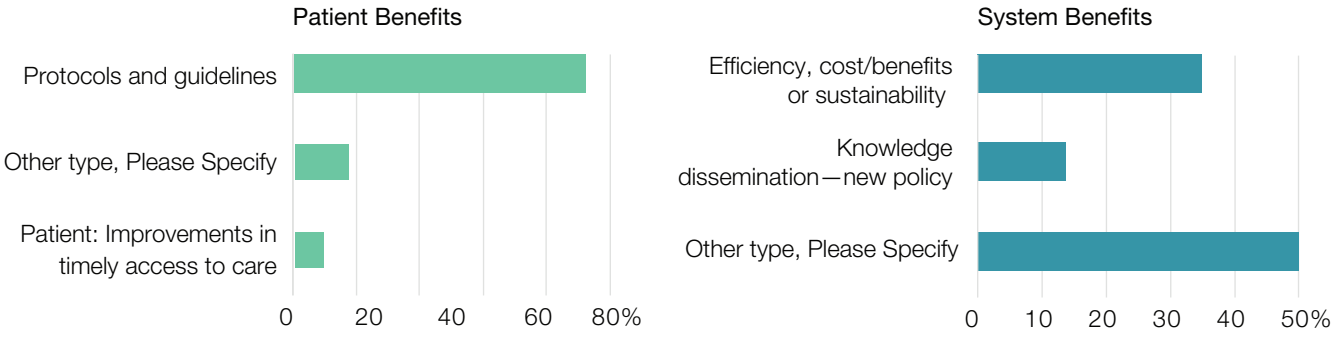
Research Benefits

Again this year, data stewards were asked to classify the research benefits identified for FY 2015–16 into two distinct categories; Patient Benefits and System Benefits. See below for further detail on benefit types. Benefits resulting from research activities are close to being evenly split with 52% attributed towards System Benefits and 48% towards Patient Benefits.

Figure 52 shows the percentages for each benefit category as a result of the registry and dataset usage for FY 2015–16.

Benefit Type	Benefit Sub-type
Patient Benefit:	Delay of disease progression/survival.
	Access to new treatment/technology
	Protocols and guidelines
	Improvements in timely access to care
	Other
System Benefits:	Process of care: standardization
	Process of care: protocol implementation
	Efficiency-cost/benefits or sustainability
	Knowledge dissemination: new policy
	Resource improvements: workforce
	Other

FIGURE 52 Percentage of Benefit Sub-type by Type for FY 2015-16



A sample of patient and/or system benefits that were quantified, identified, or attained in FY 2015–16 that resulted from research based on the registry or dataset is excerpted in Table 17.

TABLE 17 Registry/dataset Patient and System Benefits

BC Cancer Registry	Data from studies based on the BC Cancer Registry were used to justify and continue to be used to plan the new MoH funded childhood cancer survivor program. The work carried out with Registry data was part of the body of evidence that suggested that this population of patients have long-term late effects of cancer treatment and require additional follow-up.	System: Process of care-protocol implementation
	A paper based on BCCR data was used to derive long-term projections of future cancer cases and mortality and describe the expected increases over the coming 15-20 years for BC. The data from this report have been requested for planning exercises several times.	System: Efficiency, cost/ benefits or sustainability
	Research from the BCCR is used for significant numbers of publications each year in health services research, health economics and etiologic and outcomes research. However, although we often know of publications, we do not systematically as administrators of the data track the post-publication policies/impacts that each may have had.	System: Other type, Please Specify
BC Cardiac Registry	Examined the use of contrast during angioplasty (PCI) during annual Interventional Cardiology Quality Review with a goal to reduce over utilization of contrast during procedures to reduce the risk of kidney damage.	System: Process of care-standardization
	Examined the use of radial versus femoral access during angioplasty to move towards greater utilization of radial access to reduce bleeding in patients.	System: Process of care-standardization
	Examined transfusion rates post-surgery and post angioplasty to continue to reduce clinical variation with a goal to improve patient outcomes and to reduce cost associated with unnecessary transfusions.	System: Efficiency, cost/ benefits or sustainability
	Examined the repeat procedure rates and complication rates following pacemaker or ICD implantation with a goal to improve patient outcomes and reduce cost associated with repeat procedures.	Patient: Protocols and guidelines
	Examined the variation in outcomes following ablation for atrial fibrillation with a resulting benefit of discussion and standardization of procedure technique and protocol standardization.	System: Process of care-standardization

BC Perinatal Database Registry	Routine surveillance of congenital anomalies has shown recent increases in ankyloglossia (tongue-tie) and its surgical treatment (frenotomy)in BC.	System: Other type, Please Specify
	The Adverse Outcome Index (AOI) uses routinely-collected data in a population-based perinatal database to examine variation in the indicator over time and between hospitals as a quality of care indicator.	System: Other type, Please Specify
	The Adverse Outcome Index was used to understand how a small rural hospital closure affects maternal & newborn outcomes.	System: Efficiency, cost/ benefits or sustainability
	Gestational diabetes: a population level cohort analysis in the two provinces of Alberta and British Columbia helped to highlight how changes in protocol (screening) impacted population risk of gestational diabetes.	Patient: Protocols and guidelines
	Deriving Catchment Areas and Estimating Travel Time to Obstetric Facilities in British Columbia. This project increased understanding of timely access to maternity health services in BC.	Patient: Improvements in timely access to care
BC Trauma Registry	VTE proxphylaxsis timing was evaluated to ensure best outcomes.	Patient: Protocols and guidelines
	Studied the impact of a trauma service on a level 3 center. Found itreduced rework and led to better patient outcomes.	System: Efficiency, cost/ benefits or sustainability
	Analyzed whether there is greater effectiveness of mesh split thickness by increasing the thickness.	System: Knowledge dissemination-new policy
	Evaluated if MRI or 64 slice CT gives better specificity for cervical spine clearance.	Patient: Protocols and guidelines
Cervical Cancer Screening Database	The HPV FOCAL trial continues to accrue evidence that will be used to inform cancer screening guidelines for cervical cancer in BC. In the stated fiscal year period, FOCAL team members have presented at prestigious conferences such as EUROGIN (European conference on HPV and cancer) and IPV (International Papillimavirus Conference); they have also published 3 peer-reviewed papers in this period alone. In this period, this project alone has contributed 11 publications (3 journal articles and 8 conference proceedings) to the body of evidence around cervical cancer screening and HPV testing.	Patient: Protocols and guidelines
PREDICT	The PREDICT project has provided direct (~970) opportunities to patients to contribute to and partner with our research project.	Patient: Other type, Please Specify
	PREDICT has supported researchers in North America with over 700 participant biospeicmens and data to support cancer research.	System: Other type, Please Specify
Screening Mammography Database	Development of letters for physicians to use to notify their overdue patients to return for screening.	System: Other type, Please Specify

Tumour Tissue Repository	The TTR has provided direct (~300) opportunities to patients to contribute to and partner with our research program.	Patient: Other type, Please Specify
	The TTR has supported BCCA researchers to secure grant funding for research programs in addition to generating high profile/impact research publications.	System: Other type, Please Specify
	The TTR continues its partnership with the Canadian Tissue Repository Network and UBC's Office of Biobank Education and Research to support the work of the Biobank Resource Centre in assisting biobankers. TTR support included: 1) Hosting a 2-month fellowship for a pathologist/biobanker from New Delhi India. 2) Continuing assistance with the development of biobank education modules. 3) Assistance with program testing ahead of the launch of the Biobank Registration and Certification Program for researchers and biobankers internationally.	System: Other type, Please Specify
BCAS/ROC - Cardiac Arrest Registry	Three local studies were used to inform an out of hospital ecmo study currently being performed in VCH/Providence Healthcare.	Patient: Protocols and guidelines
	ROC network research has informed the ILCOR and AHA guideline annual updates. Guidelines that would be impacted by these publications are not due until 2020.	Patient: Protocols and guidelines
	Evidence related to chest compression fraction, chest compression rate and chest compression depth is being used within BCEHS for cardiac arrest resuscitation.	System: Process of care-protocol implementation
	ROC data informed the RCT of Amiodarone, Lidocaine, Placebo .... resulting evidence is being used to guide cardiac arrest resuscitation.	System: Process of care-standardization

Appendix 1: Example Research Questions by Registry/Dataset

BC Cancer Registry	Utilization and quality of preventive health care among adult cancer survivors
	Prevalence and cost of futile interventions for common comorbidities in terminally-ill cancer and cardiac patients in British Columbia
	Investigations into screening mammography participation, retention and outcomes in British Columbia, Canada
	Socio-demographic characteristics of women with cervical cancer in British Columbia: 2004–2013
	Patterns of radiotherapy technique use in the treatment of bone metastases
	Prescription drugs and subtype-specific breast cancer risk
	The economics of personalized oncogenomics in BC: Cost-effectiveness of precision medicine oncogenomic care in BC
	Incidence of oral cancer among South Asians in British Columbia
	A population based study on the late effects and long term outcomes for survivors of stage I-II seminoma treated in British Columbia.
	Assessing tobacco-related cancers among individuals with psychiatric or drug use disorders in British Columbia
BC Cardiac Registry	What are the trends in outcomes for elderly angioplasty patients?
	What are the clinical outcomes for patients receiving multiple artery conduits in CABG surgery?
	What are the readmission trends for heart failure patients after receiving transcatheter heart valve replacement?
	What are the clinical outcomes following laser lead extraction and the lead complications by lead type?
	What are the cardiac services utilization rates and outcomes within the First Nations patients?
	What are the cardiac post procedure outcomes for rural remote patients in BC?
	What is the proportion of patients with an ejection fraction below 30% who received an ICD implant?
BC Perinatal Database Registry	A retrospective review of hysteroscopic removal of lost IUD in pregnant patients.
	The impact of inflammatory bowel disease (IBD) and IBD medications during pregnancy on maternofetal health outcomes
	Risks of adverse pregnancy and birth outcomes according to maternal age and inter-pregnancy interval
	Developmental origins of autism: A population level linked data study of potentially modifiable risk factors
	Neonatal group B streptococcal disease: Burden of illness and assessment of preventability in British Columbia
	Impact of delayed cord clamping on 5-minute Apgar score and early childhood development at 5 years of age
	Perinatal epidemiology - School of Population and Public Health, training data set

	Validation of the CPSS algorithm for identifying labour using data from Perinatal Services BC
	The impact of maternal weight and gestational weight gain on birth weight
	Safety of labour and delivery following obstetrical service closures in small community hospitals in British Columbia
BC Trauma Registry	Optimal timing of venous thromboembolism prophylaxis in traumatic brain
	The meshed split thickness skin graft: A Review
	Evaluation of a 64-slice computed tomography protocol to clear cervical spinal injuries
	Impact of a trauma service at a Level III trauma center
Cervical Cancer Screening Database	Projected impact of HPV and liquid based cytology primary testing on rates of referral for colposcopy in a Canadian Cervical Cancer Screening Program
	HPV Focal Trial: Results over two rounds of screening in the safety and controls arms of the HPV FOCAL Trial.
	Comparison of the roche cobas 4800 and Digene Hybrid Capture 2 HPV tests for primary cervical cancer screening in the HPV FOCAL trial.
	Socio-demographic Characteristics of Women with Cervical Cancer in British Columbia: 2004–2013
	Evaluation of HPV prevalence and genotype in a cohort of BC Invasive cervical cancer cases
PREDICT	Targeted Re-sequencing and Fine Mapping of Breast Cancer Susceptibility Loci at Chromosome 4q31.22—Identified by Genome Wide Association Study
	Evaluation of a Potential Serum Biomarker in Subjects with Advanced Non-Small Cell Lung Cancer Treated with Standard of Care Chemotherapy
Screening Mammography Database	To quantify the relative risk of invasive and in situ cancer detection in the subsequent screening session following a false positive mammogram
	To assess mediating variables that may explain the relationship between shiftwork and breast cancer, including biological and behavioural variables
	To determine if health inequities play a role in eligible women's decision to participate in and access screening services
	To examine selected cancer incidence and screening indicators at various geographic, demographic and socio-economic levels, to provide insights into the health of specific subpopulations and would demonstrate potential gaps for targeted reduction of health inequity
Surgical Patient Registry	What is the blood usage for particular types of surgeries?
Tumour Tissue Repository	Understanding the mechanisms of lung cancer development in never smokers.
	CD74 and intratumoral immune response in breast cancer
	A Pan-Canadian discovery and validation platform to identify biomarkers is used to optimize immunohistochemisty ancillary tests for histotyping of ovarian cancer.
	Targeted Re-sequencing and Fine Mapping of Breast Cancer Susceptibility Loci at Chromosome 4q31.22—Identified by Genome Wide Association Study
	Re-targeting virus-specific CD8+ T cells to recognize and attack tumours
	Determining the signaling properties of tumor infiltrating lymphocytes using a novel method of in situ stimulation

BC Children's BioBank	High-throughput technology for human antibody discovery
	Origin and significance of altered DNA replication timing in pediatric leukemia
	Comparing NANS deficiency bone marrow B cell immunophenotyping with normal pediatric bone marrow B cell profiles
	Prospective generation of pediatric leukemia relapse by xenotransplantation
BCAS/ROC—Cardiac Arrest Registry	For patients in persistent out of hospital cardiac arrest, at what point does ongoing prehospital resuscitation effort result in decreasing survival?
	We sought to identify patients who fulfilled a set of ECPR criteria in order to estimate: (1) the proportion of patients with refractory cardiac arrest who may have benefited from ECPR; and (2) the outcomes achieved with conventional resuscitation.
	The primary objective of this study was to assess the relation-ship between clinical outcomes and the elapsed duration since commencement of professional resuscitation, comparing differences between those with initial shockable and non-shockable rhythms.
	This study examined the relationship between gender and outcomes of non-traumatic out-of-hospital cardiac arrest (OHCA).
	We sought to determine the differences in chest compression fraction between adult out-of-hospital cardiac arrest (OHCA) receiving intubation and those receiving supra glottic airways
	The aim of this study was to estimate overall and regional variation in incidence and outcomes of out-of-hospital cardiac arrest due to overdose across North America.
	We evaluated the relationship between chest compression fraction and clinical outcomes in a secondary analysis of the Resuscitation Outcomes Consortium PRIMED trial.
	The main objective of this study was to describe the quality of CPR performed during pediatric OHCA resuscitation attempts.
	This study was performed to determine which times on the scene and which prehospital interventions were associated with improved survival.
PROMIS—Renal	Effect of Symptom management using standardized tools
	Cost effectiveness and impact of standardized protocol for anemia management
	Survival of patients on dialysis as a consequence of phosphate treatments
	Resource utilization of Peritoneal dialysis patients exposed to home assistance program
	Maintenance of home based therapies in a provincial model
	Prevalence of PCKD in BC

Appendix 2: Framework for PHSA Research Metrics

1. **Indicator: Producing and Advancing Knowledge**
   This category includes measures reflecting discoveries/new knowledge, and contributions to scientific literature.

   a. Total annual grant awards by agency/research entity and PHSA
   b. Total annual external grant awards by agency/research entity, identified by major funding categories (e.g., tri-council, provincial, Genome Canada/BC, international, private sector, etc.)
   c. Annual grant application success rate by agency/research entity and PHSA
   d. Total # Publications
   e. Citations

2. **Indicator: Building Research Capacity**
   This category includes measures reflecting enhancements to both human resource and infrastructure capacity.

   a. Total # trainees by agency/research entity
   b. Scholarships/fellowships by agency/research entity
   c. Total # researchers by agency/research entity
   d. Infrastructure investments
      i. E.g. Hospital research fund, CFRI, capital projects etc.
      ii. Databases (patient, tissue) etc.
   e. Indirect Costs Program

3. **Indicator: Achieving Economic Benefits and Innovation**
   This category includes measures reflecting commercialization of discoveries, revenues and other economic benefits resulting from discoveries, and general impacts on the BC economy.

   a. # Intellectual property disclosures, patents by agency/research entity
   b. Licenses, royalty income, spin-off companies
   c. New research hires to agency/research entity - job creation?
   d. Policy initiatives

4. **Indicator: Advancing Health and Policy Benefits**
   This category includes measures reflecting individual and population health impacts of research in prevention, diagnosis and treatment.

   a. Clinical trials (translational research)/patient outcome data
   b. New clinical guidelines/patient outcome data
   c. New drugs funded/patient outcome data
   d. Policy initiatives/patient outcome data

Appendix 3: Research Metrics Working Group Membership*

Dug Andrusiek
BC Emergency Health Services

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Karin Jackson
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Karen Hagan
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Chandan Bassi
Manager, Research Services, Child & Family Research Institute

Beth Palacios
Consultant, Performance Measurement & Reporting, PHSA

Priscilla Vuong
Research Development Unit Manager, BC/UBC Centre for Disease Control

*As of September, 2015

Appendix 4: Glossary

GLOSSARY	
Term	**Description** *[data source]*
Metric Definitions	
Metrics 1ab, 2b Total annual grant awards, Total annual external grant awards by major funding categories by agency or research entity	Total Annual Award ($) for Grants, Awards and Contracts by Funding Source *[RISe annual file provided by UBC Office of Research Services]*
Metric 1c Annual grant application success rate by agency/ research entity. Added in FY 09–10	Success rates for two CIHR operating grant competitions (March and September of applicable year) for BCCA and CFRI, BCMHSUS and WHRI. *[CIHR website for National results; Agency results self-reported on the excel data collection form]*
Metric 1d Total # of Publications Added in FY 10–11; Category addition in FY 11–12	Total number (of publications, not authors) published within applicable fiscal year meeting the following criteria: Book, book chapter, reports produced for the government, peer-reviewed publication inclusive of published journal articles, case reports, essays, literature reviews, e-journals and monographs. Excluded = abstracts, editorials, summaries, letters to the Editor, epubs, in press and submitted publications. *[Agencies self-report utilizing SciVal to search Scopus utilizing researcher name; Agency inputs data on excel data collection form]*
Metric 2a Total number of trainees by agency/research entity	Total Number (head count, not FTE) of Research Trainees by Student Type. (Exclude clinical trainees who are supported during their brief research rotations.) Research trainees counted will be any individuals who are primarily supervised by a researcher affiliated with the reporting unit, during all or a portion of the reporting year. *[Agencies manually request trainee statistics from individual investigators and input data on excel data collection form]*
Metric 2c Total number of researchers by agency/research entity	List of Researcher Names including Research definition (This metric is to be collected based on CFRI methodology category types wherever possible, if not available in that format, please designate your category as "5" and add your research definition in the space provided.) Added in FY 11–12 is a column to collect whether a researcher is a shared resource or 100% attributable to a specific agency. *[Previous year's researchers are provided to each agency from the researcher database in excel; Agencies provide additions, deletions, changes on excel data collection form]*
Metric 2d Infrastructure Investments: Major CFI Infrastructure Grants (Added FY 10–11)	Total FY $ for Leading Edge Fund (LEF)/New Initiatives Fund (NIF) awards from Canada Foundation for Innovation. LEF projects sustain and further enhance the most advanced research and technology development efforts already supported by past CFI investments. LEF projects build on existing areas of research priority where institutions have a competitive advantage and a proven track record in enhancing Canada's science and technology capacity. NIF projects build Canada's capacity in new, promising areas of research and technology development. Also included in these amounts are the matching funds (industry, educational, charity, etc.) to these awards. Excluded from these amounts are $'s associated with the Infrastructure Operating Fund (IOF) or Leaders Opportunity Fund (LOF) from CFI. These get reported under Infrastructure—HR awards and operating grant categories respectively. *[RISe annual file provided by UBC Office of Research Services]*

GLOSSARY	
Term	**Description** *[data source]*
Metric 2e Indirect Costs Program grants (Added FY 12–13)	A federally funded grant to Canadian post-secondary institutions to help pay the indirect costs of research (e.g. salaries for research administrative staff, administrative costs associated with patent activities, maintenance of lab space). These annual grants are based on a formula related to tri-council award amounts (CIHR, NSERC, and SSHRC) and are paid to the research institutes based on a formal revenue sharing agreement. Due to how UBC is now reporting revenue precipitated by policy changes of the CAUBO (Canadian Association of University Business Officers), PHSA includes revenue related to the Indirect Costs Program (ICP). *[RISe annual file provided by UBC Office of Research Services]*
Metric 3a # of intellectual property disclosures, patents by agency/research entity	Total number of Invention Disclosure (internal documents), provisional patent and PCT applications by fiscal year. *[BCTDO (for BCCA) and UILO (all other agencies) complete the excel data collection form]*
Metric 3b Licenses, royalty income and # spin-off companies (Revised FY 10/11) (Revised Net Licensing Rev definitions in FY 2013–14)	Total number of active license/assignment agreements and spin-off companies. List the names of all active spin-off companies. These numbers represent cumulative totals from year to year and are no longer reported by region. IP related revenue shall follow the UILO (University-Industry Liaison Office) definitions from FY 2010–11 forward. **Definitions:** **Gross licensing revenue** = Royalties + Equity Liquidated + Option Fees + License Fees + License Management + Technology Assignment; · Royalties: royalty payments including minimum annual royalty payments · License Fees: upfront payments, milestone payments and other payments associated with the license · License Management: legal fees incurred by TDO (Technology Development Office) or UILO relating to the licensed IP and reimbursed by licensees **Total TDO Expenses for patenting and legal costs** **Expenses for Licensed IP:** patenting, legal and related costs associated with licensed IP **Realized revenue per distribution agreements:** revenue accrued to PHSA agency after distribution to inventors, obligations due to affiliated academic institutions, granting agencies and inventor departments. The revenue distribution varies by entity and will be noted in the narrative. **Royalty, equity liquidated and licensee fees** When the UILO licenses technology to a company, the terms of the license typically include a requirement to pay a % royalty on product sales, an upfront license fee and an annual license maintenance fee. The UILO may also negotiate an equity component (company stock) as part of the license agreement. Under the licensing scenario, the University still owns the technology but is granting a license to a third party. **Option Fees** This relates to the scenario when a company desires an option on a technology (essentially reserving/holding the technology). These are usually short-term contracts that have a modest option fee. **Technology Assignment** This relates to the scenario when a company wishes to take ownership of the technology and in return pays an Assignment fee. *[BCTDO (for BCCA) and UILO (all other agencies) complete the excel data collection form]*

GLOSSARY	
Term	**Description** *[data source]*
Funding Type Categories (columns)	
Funding Types/Grant Types	The columns on worksheet 1ab, 2b that correspond to the funding types agreed to by the Research Metrics Working Group on July 22, 2009 and revised at the working group's direction in subsequent fiscal years.
Salary Awards	
Faculty and other personnel support	Dollar amount for FY for supported faculty salary awards including chairs.
Trainee salary support	Dollar amount for FY for supported trainee salary awards including trainee research allowances.
Infrastructure Awards	
Human Resources	Dollar amount for FY for Human Resource Infrastructure including Michael Smith Foundation for Health Research (MSFHR)—team start-up, team, research units, platforms, networks and institutional infrastructure, CFI Infrastructure Operating Fund (IOF) awards.
Capital, Equipment, Construction	Dollar amount for FY for capital, equipment, or construction awards including BC Knowledge Development Fund (BCKDF), matched sources (charities, industry) and other large equipment grants. Excluded are Canada Foundation for Innovation (CFI) awards (see next category).
Capital, Equipment, Construction – Major CFI (Added in FY 10–11)	Dollar amount for FY for capital, equipment, or construction Major Canada Foundation for Innovation (CFI) awards for Leading Edge Fund (LEF)/New Initiatives Fund (NIF) awards. Also included in these amounts are the matching funds (industry, educational, charity, etc.) to these awards. Excluded are $'s associated with the Infrastructure Operating Fund (IOF) or Leaders Opportunity Fund (LOF) from DFI. These get reported under Infrastructure - HR and Operating Grant categories respectively. (see Metric definition 2d for further detail)
Operating Grants	
Operating or Project Operating Grants (not exclusive of the next three columns)	Dollar amount for FY for operating or project operating grants including when the salary component is embedded in a grant; includes establishment grants; includes development grants.
Clinical Trials (4a) (Definition clarified in FY 10–11)	Dollar amount for FY for any research project that prospectively assigns human participants or groups of humans to one or more health-related interventions to evaluate the effects on health outcomes. Health related interventions include any intervention used to modify a biomedical or health-related outcome, for example drugs, surgical procedures, devices, behavioral treatments, dietary interventions, and process-of-care changes. Health outcomes include any biomedical or health related measures obtained in patients or participants, including pharmacokinetic measures and adverse events.
Clinical Trials (4a) (Definition clarified in FY 10–11)	Dollar amount for FY for research involving a new laboratory technique or process, e.g. a new more cost effective processing for a genetic diagnostic test, or a new tissue preparation process, etc. Trials that may use clinical material but do not directly involve patients in the research or involve a risk to the patients (may involve their tissue or blood samples however).

GLOSSARY	
Term	**Description** *[data source]*
Grant in Aid	Dollar amount for FY for Grant-in-aid awards (Broad topic but not directed). A Grant-in-Aid is essentially a donation to one or more researchers, normally to conduct research in an area that is of mutual interest to both the donor and the researcher(s). These grants are normally in the form of a one-page letter addressed to a researcher and signed by the donor, and accompanied by the grant funds. Characteristics: · Sponsor supports research activities of an individual researcher or group of researchers. Sponsor does not restrict use of funds · Funds are paid in advance · No invoicing or financial statements are required by Sponsor · University/Host Institution retains all rights to inventions and other intellectual property · University/Host Institution is free to publish results · University/Host Institution provides the Sponsor with a final report only · Parties to the Agreement: University/Host Institution and Sponsor (may include University/ Host Institution Affiliated Hospitals)
Other Funding Type: Service Contracts Added as sub–type of Other Funding Type -ategory in FY 2010–11	Characteristics: (1) Solely for testing, evaluation or analysis of materials or compounds owned by the Sponsor with no intellectual input or value-added by UBC. (2) Sponsor retains all rights to intellectual property provided by the Sponsor for the services
Other Funding Type: Donations & Endowment Interest Added as sub-type of Other Funding Type category in FY 2010–11	A donation is a gift given by an individual or an organization to a non-profit organization, charity or private foundation in support of a specific purpose. Endowment—gift of money or income producing property to a public organization (such as a hospital foundation or university) for a specific purpose (such as research or scholarships). Generally, the endowed asset is kept intact and only the income (known as endowment interest) generated by it is consumed.
Other Funding Type	Dollar amount for FY, combined, of any grant, award or contract that does not fit into the above categories. Please specify name of Funding Type in space provided.
Funding Source Categories (rows)	
UBC RISe Sector	Sector denotes an area of the **economy** in which the funder is assigned. This decision is based on how the organization is funded. Three sectors are currently utilized by UBC's Research Information System (RISe) and include: **Non-Profit:** funding provided mostly by private donations and endowments. **Industry:** funding provided by a for-profit business in the private or commercial sectors of business. **Government:** funding provided by local, provincial, national, federal or foreign government entity. [definitions to be further developed with input from Working Group and RISe personnel]
Funding Sources/Granting Agency	The rows on worksheet 1ab, 2b that correspond to the funding sources agreed to by the Research Metrics Working Group on July 22, 2009 and modified in subsequent fiscal years.

GLOSSARY	
Term	**Description** *[data source]*
CIHR and its institutes (included in Major Canadian Funding Category)	The Canadian Institutes of Health Research and its thirteen subsidiary institutes: · Aboriginal Peoples' Health · Aging · Cancer Research · Circulatory and Respiratory Health · Gender and Health · Genetics · Health Services and Policy Research · Human Development, Child and Youth Health · Infection and Immunity · Musculoskeletal Health and Arthritis · Neurosciences, Mental Health and Addiction · Nutrition, Metabolism and Diabetes · Population and Public Health
CCSRI (formerly NCIC/Canadian Cancer Society/CCSR) (name changed to CCSRI for FY 11–12 and moved to CDN Foundation & Non-profit category)	On February 1 2009, the Canadian Cancer Society integrated the operations of the National Cancer Institute of Canada (NCIC), creating the Canadian Cancer Society Research Institute. Grants from all three of these organizations should go in this category.
NSERC (included in Major Canadian Funding Category)	Natural Sciences and Engineering Research Council
SSHRC (included in Major Canadian Funding Category)	Social Sciences and Humanities Research Council
Genome Canada and provincial Genome agencies (included in Major Canadian Funding Category)	Genome Canada, and its regional centres: Genome BC, Genome Alberta, Ontario Genomics Institute, Genome Quebec, Genome Prairie, and Genome Atlantic
MSFHR (included in Major Canadian Funding Category)	Michael Smith Foundation for Health Research (BC)
Canadian Industry	Canadian-based for-profit corporations. Decisions on whether a funding source is Canadian or Foreign are driven by award payment or contract address.

GLOSSARY	
Term	**Description** *[data source]*
Canadian Foundations & Non-Profits (name modified in FY 12–13 to align with UBC categories—all historical data was recoded)	Canadian not for profit organizations including foundations and charities. These include grants that are "internally" sourced (i.e. that are from CFRI, BCCA or their affiliated Foundations such as BCWF, BCCHF, and BCCF etc.)
Canadian Educational Institution	This was added in FY 09-10 as a separate Funding Source Category and includes all educational and/or academic institutions in Canada. Foreign Educational Institutions are categorized under Foreign Other Source.
Canadian Government	Provincial, municipal, territorial or federal governments and crown corporations in Canada
Foreign Industry	For-profit corporations outside Canada. Decisions on whether a funding source is Canadian or Foreign are driven by award payment or contract address.
Foreign Foundations & Non-Profits (name modified in FY 12–13 to align with UBC categories—all historical data was recoded)	Not for profit organizations including foundations and charities headquartered outside Canada, e.g. March of Dimes, American Cancer Society
Foreign Government	Provincial, municipal, territorial or federal governments and government controlled corporations outside Canada including the armed forces (e.g. US Military)
Foreign Other Source	All Foreign funding sources not captured in the above Foreign categories including Foreign Educational Institutions.
Research Trainees Categories (columns)	
Research Trainee	Total number of research trainees by student type excluding clinical trainees who are supported during their brief research rotations. Research trainees counted will be any individuals who are primarily supervised by a researcher affiliated with the reporting unit, during all or a portion of the reporting year.
Masters	Graduate students enrolled in a full time Master's program who are supervised by a faculty member affiliated with the reporting organization.
Doctoral (changed from PhD in FY 2010–11)	Graduate students enrolled in a full time PhD program who are supervised by a faculty member affiliated with the reporting organization.
Post–doctoral	Full time post-doctoral fellows whose primary focus is research (NOT clinical fellows)
Summer students (short term)	High school and or university students who are engaged in a short term program with the reporting agency for a limited period (e.g. over the summer, a few weeks)
Residents	MDs engaged in a residency program that may include a research rotation
Practicum, co-op, honors and directed studies students	High school and/or university students whose assignment to the reporting organization is according to a practicum, co-op, honours and/or directed studies program
Other Research Trainee Type	(Reporting organization to specify definition)

GLOSSARY	
Term	**Description** *[data source]*
Research Trainees (rows)	
Do you Support These Types of Research Trainees	To be answered Yes or No for each Research Trainee Category listed above. Is used to indicate that a research entity does have Research Trainees of this type but has no data collection ability. This will distinguish between those with zero (0) Trainee types from those that have them but can't count them.
Total Head Count	Total number of research trainees of that type, not an FTE (Full Time Equivalent number).
List of Researcher Name (columns and row)	
Category (modified to add Shared Membership sub-category under CFRI categories 1–3 in FY 2010–11)	A number one through five (MUST have one selected). Categories 1–4 are as described in the CFRI "Guide for Completing an Application for Membership" available online at http://www.cfri.ca/research_support/forms/membership.asp. These categories are based on a calculation of a given individual's research hours/week. Category 5 will be for those research entities/agencies who do not utilize the CFRI categories. If you utilize category 5, please indicate the definition that your research entity/agency uses to define Researchers. A shared membership sub-category available in CFRI Categories 1–3 was added in FY 2010–11. This new category allows individuals to formally declare their alignments (including percentage affiliation) with more than one organization. Category 4 was clarified to include only affiliate investigators that are not based on site but who collaborate with agency members. Their primary affiliation will be with another academic and/or research institution.
First, Last, Middle name	Self-explanatory, e.g. Jane Mary Smith
Short Name	Name as it would appear in PubMed, for example, Smith, JM
Count Attributed to Agency Added in FY 11–12	An indication by number (1 or .5) of whether a researcher is attributable to applicable agency 100% (full) or 50% (shared).
UBC's definition of Research Added in FY 13–14	UBC defines research involving human subjects as "any systematic investigation (including pilot studies, exploratory studies, and course based assignments) to establish facts, principles or generalizable knowledge which involves: living human subjects; or human remains, cadavers, tissues, biological fluids, embryos or foetuses." It does not include…"quality assurance studies, performance reviews or testing within normal educational requirements, or activities undertaken for administrative or operational reasons…" unless they include an 'element of research.'
OTHER	
Fiscal Year 08–09	April 1, 2008–March 31, 2009
Fiscal Year 09–10	April 1, 2009–March 31, 2010
Fiscal Year 10–11	April 1, 2010–March 31, 2011
Fiscal Year 11–12	April 1, 2011–March 31, 2012
Fiscal Year 12–13	April 1, 2012–March 31, 2013
Fiscal Year 13–14	April 1, 2013–March 31, 2014
Fiscal Year 14–15	April 1, 2014–March 31, 2015
Fiscal Year 15–16	April 1, 2015–March 31, 2016