PHSA Research Metrics

4th Annual Report

Fiscal Year 2011-12

Prepared For: PHSA Research Committee
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PHSA Research Metrics Working Group
PHSA Performance Measurement & Reporting

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 1). 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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PHSA Research Metrics Fiscal Year Summary – PHSA Overall

Indicator		Key Measure Description	FY 2011-12 Value	FY 2010-11 Value	FY 2009-10 Value
Producing & Advancing Knowledge	1a	**Total Annual Grant Awards by Type (excluding Major* CFI Infrastructure grants)**	**125,554,906**	**127,823,436**	**114,975,373**
		Salary Awards	12,332,704	13,169,936	12,773,593
		Infrastructure Awards – HR & Minor CFI	7,611,165	8,353,900	7,670,729
		Operating Grants	98,270,202	99,851,648	90,062,320
		Other	7,340,835	6,447,951	4,468,731
		Total Annual Grant Awards including Major CFI Infrastructure grants (see 2d below)	**127,411,629**	**138,721,931**	**151,677,259**
	1b	**Total Annual Grant Awards by Major Funding Source (excluding Major* CFI infrastructure grants)**	50,858,014	49,656,972	57,305,640
		Major Canadian Funding Entity	55,110,633	53,986,264	41,383,666
		Other Canadian Sources	19,586,258	24,180,199	16,286,067
		Other Foreign Sources			
	1c	Annual Grant Application Success Rate – CIHR March Competition – PHSA Overall/Nat'l Rate	16.7%/20.1%	21.0%/18.2%	27.7%/21.7%
	1c	Annual Grant Application Success Rate – CIHR Sept Competition – PHSA Overall/Nat'l Rate	32.3%/22.1%	26.8%/21.4%	41.3%/18.3%
	1d	Total # of Publications with Agency Author			
		CFRI	620	563	
		BCCA	352	353	
		WHRI	196	154	
		BCCDC	102	90	N/A
		BCMHARI	68	80	
		BCAS	0	4	
Building Research Capacity	2a	Total # of Research Trainees	1,009	1,147	948
	2c	Total # of Researchers	677	633	526
	2d	Infrastructure Investment – Major CFI Infrastructure Grants	1,856,724	10,898,496	36,701,886
Achieving Economic Benefits & Innovation (BCCA, CFRI & BCCDC only)	3a	# of Invention disclosures	45	46	51
		# of Provisional Patent applications filed	26	25	30
		# of PCT applications filed	6	7	8
		# of Patents Filed/Issued	16/5	45/6	3/2
	3b	# Active License Agreements	114	101	101
		# of Spin-off Companies	10	7	7
		IP related revenue (net licensing revenue) – Future reporting for PHSA Overall	N/A	N/A	N/A
Advancing Health & Policy Benefits	4a	**Clinical Trials**			
		# active trials as of FY close	393	372	122
		Total Subject Enrollment	9,045	11,089	2,016
	4b,c,d	**Registries as Research Resources**			
		# of Research Requests/Approvals	193/186	159/82	159/119
		# of scholarly articles published	133	18	49

*see definition of Major CFI grants in Glossary – Appendix 4

Executive Summary

This is the fourth annual Research Metrics Report, based on the Framework for PHSA Research Metrics previously approved by the PHSA Research Committee (see appendix 2). All previously reported qualitative and quantitative metrics have been updated to include data for FY 2011-12 in the Framework's four categories; **Producing & Advancing Knowledge**, **Building Research Capacity**, **Achieving Economic Benefits & Innovation**, and **Advancing Health & Policy Benefits**. In addition, this year saw the refinement of one metric; Total Number of Publications in the category of Producing & Advancing Knowledge. The data was collected by type and category of publication and is presented in the agency specific sections. This is an important metric in that it recognizes the excellence of peer-reviewed, current research efforts, some of which are in the area of basic/discovery research and which are important for priming the pipeline of discovery to generate future translational research.

Each report, beginning with this year, will include data for three fiscal years on a rolling basis. The results for each metric are provided in a one 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 & Addictions Research Institute (BCMHARI), British Columbia Centre for Disease Control/UBC Centre for Disease Control (BCCDC/UBC CDC) and, British Columbia Ambulance Services (BCAS). Given its relatively low level of research activity, BCAS is not reported in a separate agency section. While there are a number of researchers associated with the 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 Page, numbers of researchers and publications have increased from 2010-11 levels. Total Annual Grant Awards ($125,554,906), without Major CFI (Canada Foundation for Innovation) grants, decreased by $2,268,530, which represents a 1.8% decrease in total awards. This is a positive result given today's global economic climate. Major CFI Infrastructure grants (see definition in the glossary) are reported separately under research capacity, indicator 2d, because these large-scale infrastructure grants are not offered every year, and are multi-year in duration. Full grant amounts for Major CFI Infrastructure grants are recorded in the year budgets are established.

PHSA research entities continue to perform well in comparison with national peers. The total number of CIHR applications for the March and September operating competitions (indicators 1c) increased from 118 to 125. Revised approvals (which occur in instances when, after the initial funding announcement, one of the CIHR Institutes decides to support highly ranked applications that have just missed the cut-off by providing a bridging award) also rose from 29 to 31, PHSA's success rates have again, surpassed the national rates for the September competition. Out of the three agencies who submitted applications for the March competition, two were above the National Average Success rates. These competitions represent only a small portion of grant applications but are reported as a good measure that is consistent across agencies and can be compared to a national rate.

Refinement in the collection of Total number of Publications this fiscal year now enables reporting by type and category of publication (peer and non-peer reviewed) in the agency specific sections. The types include books, book chapters, peer-reviewed publications including published journal articles, case reports, essays, literature reviews, e-journals, monographs and reports produced for government. It excludes abstracts, editorials, summaries, letters to the Editor, epublications, in press and submitted publications. Peer review represents the gold standard for scientific credibility. The total number 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 accurately available.

For a third year, reporting related to Indicator 3: Achieving Economic Benefits and Innovation captured numbers of intellectual property (IP) disclosures and patents at the BC Cancer Agency, CFRI and new this year, BCCDC. Data across PHSA agencies remained relatively stable. IP related revenues in the form of Net Licensing revenues increased for BCCA.

For Indicator 4: Advancing Health and Policy Benefits, a survey was issued for a third year, asking respondents to identify any guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 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. While not intended to be an exhaustive listing, resulting data highlight some of the key products

resulting from PHSA research that are improving outcomes and system sustainability. For a fourth year, a sample of patient and system benefits that were quantified, identified or attained in FY 2011-12 that resulted from research based on a registry or data set is also provided. Two new datasets were identified this year; BC Trauma Registry and the Central Transfusion Registry. For datasets and registries, an increase over FY 10-11 levels is seen for the # of research approvals from 82 to 186 and the number of requests from 159 to 193. The number of scholarly articles published as a result of research utilizing PHSA Databases and Registries increased significantly to 133 from 18. This is due, in part, to inconsistent methodologies for collection of data and cannot be attributed to higher output volume. Work is underway to re-evaluate registry data collection to increase the validity of comparisons amongst registries and data sets.

In addition, Indicator 4 information related to clinical trial activity shows an increase in the number of active trials (from 372 to 393) while total subject enrollment decreased from 11,089 to 9,045. This is an important indicator given participation in clinical trials provides patients with access to new treatments and therapies and represents the final step in translating research findings to standard of care treatment.

Complementary to this report, outcomes that help “tell the story” of how research is advancing health will continue to be reported separately in bi-annual web-based outcomes reports.

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 3) that guided data collection.

The following report was prepared with the assistance of a working group comprising representatives of each of the PHSA research entities and PHSA Performance Measurement and Reporting (see Appendix 3). 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

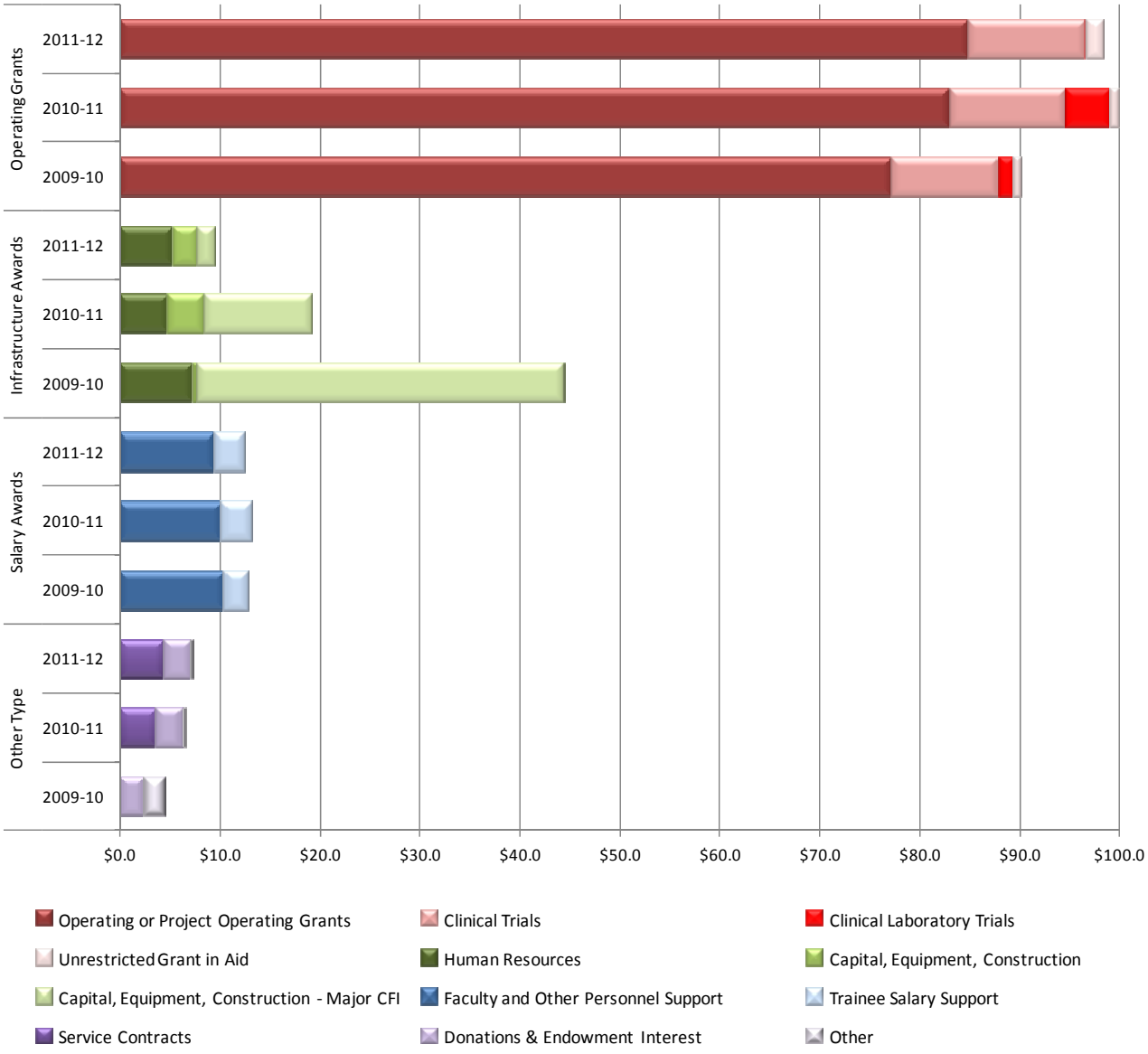
Producing and Advancing Knowledge

In FY 2011-12, researchers affiliated with PHSA were awarded a total of $127,411,629 including major CFI infrastructure grants. Operating Grants ($98,270,202) continued to make up the largest portion (76%) of total funding received. This is a 4% increase in the portion of total awards over last year. 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; salary awards have experienced an approximately 6% decline after rising each year since FY 2008-09.

A breakdown of funding types and subtypes by fiscal year can be found in Figure 1. This year, the sub-types of Operating or Project Operating Grants, Human Resources [HR awards represent team start-up, team research units, platforms, networks & institutional infrastructure and CFI IOF awards] and Faculty and Other Personnel Support garnered the largest portion of research funding in their respective type categories. Clinical Trials funding, from FY 2009-10 – FY 2011-12, continued its yearly increase. The Other Type category is comprised of Service Contracts and Donations & Endowment Interest (see glossary – Appendix 4 - for definitions).

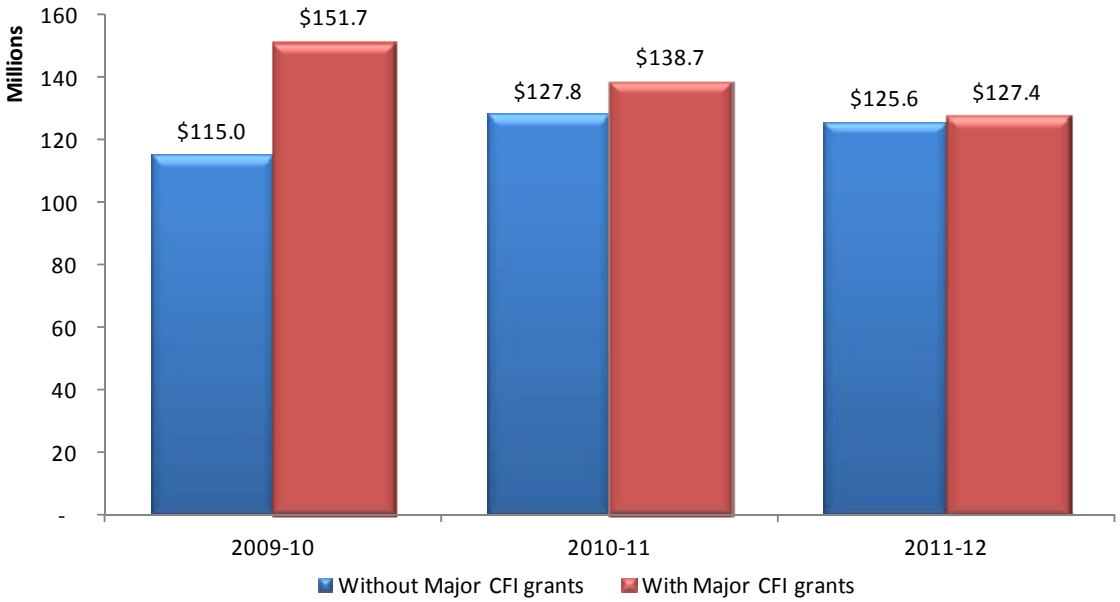
Figure 1

Total PHSA Research Funding, including Major CFI Grants by Funding Type and Sub-Type



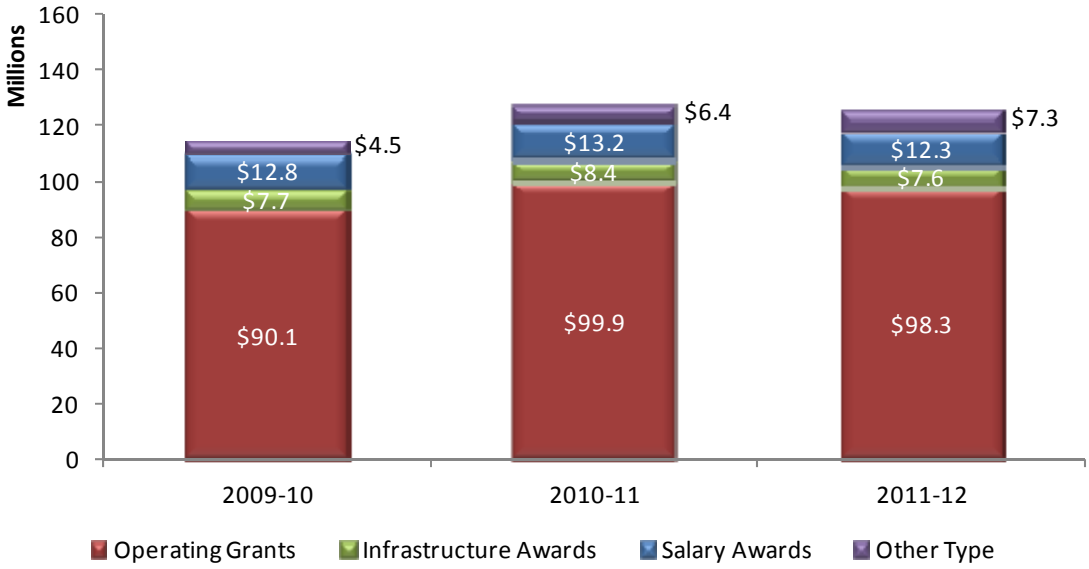
Total Funding, excluding major CFI infrastructure grants ($125,554,906), decreased by $2,268,530 from last fiscal year, or about 1.8%. Total infrastructure grants totaled $1,856,724 which is due to the fact that large-scale CFI infrastructure grants are not offered every year, are multi-year in duration, and full grant amounts are recorded in the year budgets are established. Total PHSA Research Funding showing Major CFI award impact year over year, is provided in Figure 2.

Figure 2
Total PHSA Research Funding With/Without Major CFI Grants



Additionally, Total Research Funding without Major CFI grants, by Fiscal Year and Type is shown in Figure 3.

Figure 3
Total PHSA Research Funding without Major CFI Grants by Fiscal Year and Type

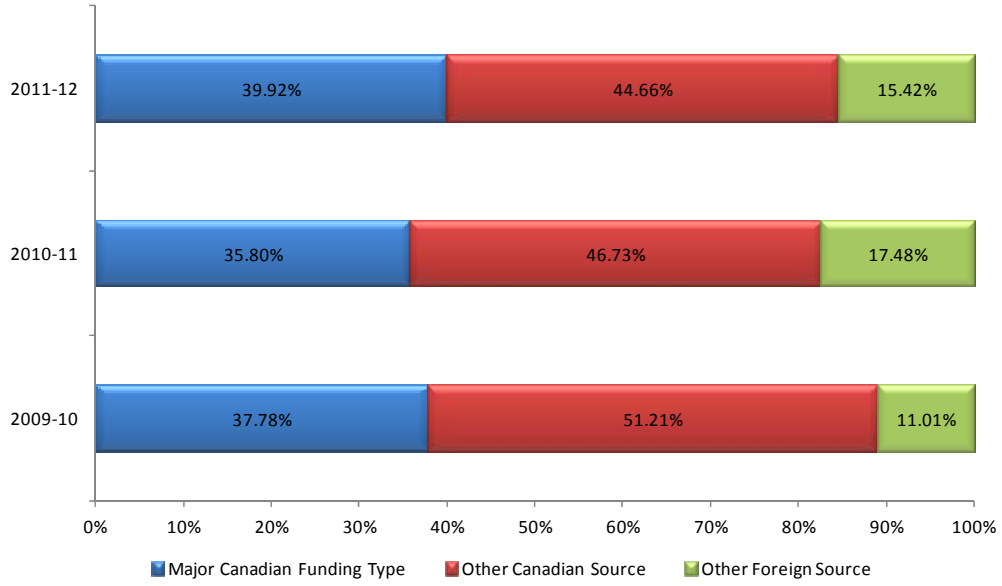


A comparison of total funding source by source category can be found in Figure 4. This figure, generated by compiling hundreds of potential sources into three main categories, highlights the extent to which primary sources of funding vary from year to year and across research entities. These data include Major CFI grants. Of note is the increase in total funding from the Major Canadian Funding Entities, even with the loss of the Michael Smith Foundation awards, to offset the drop in Other Canadian and Foreign Sources. While this increase is noted, the percent of funding from Major Canadian Funding

Entities is still far from its high of 52.5% in FY 2008-09. Major Canadian Funding entities include CIHR, NSERC, SSHRC, and Genome Canada & Agencies. Funding source categories are detailed in Appendix 5.

Figure 4

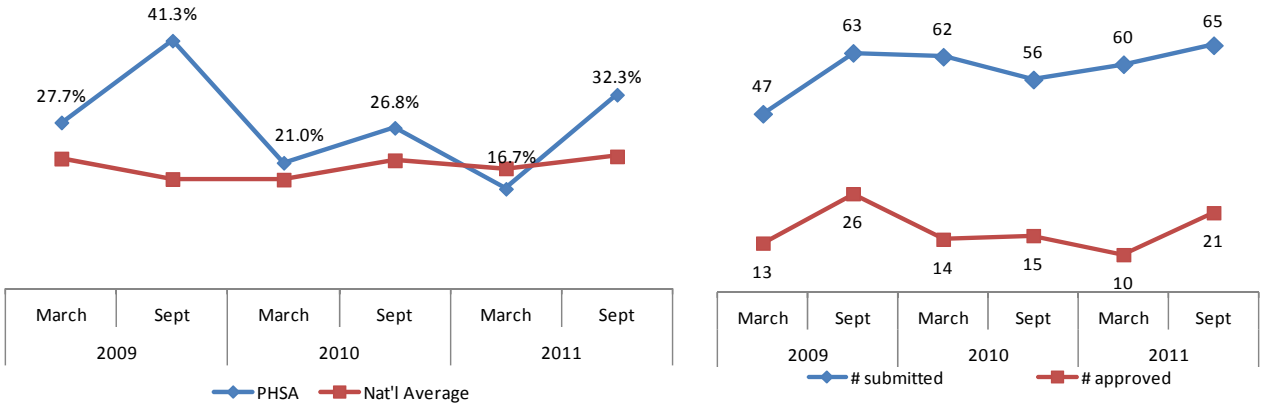
Percentage of PHSA Research Funding, including Major CFI grants by Funding Source Category by FY



Again this year, PHSA researchers have achieved positive success rates in the two most recent CIHR operating grant competitions (March and September of 2011). PHSA researchers' success rates were better than the national average for the September 2011 competition. Figure 5 below shows the overall success rates based on revised competition results for the last three fiscal years (which occur in instances when, after the initial funding announcement, one of the CIHR Institutes decides to support highly ranked applications that have just missed the cut-off by providing a bridging award) for research entities across the PHSA. National success rates are also presented for comparison. Also shown is the total number of applications submitted and approved by PHSA agencies.

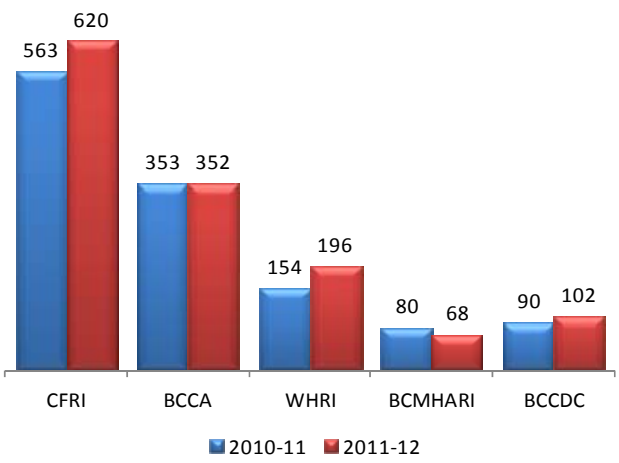
Figure 5

PHSA CIHR Application Success Rate and Number of Applications Submitted/Approved



While we reported a baseline total # of publications last year, this year we collected data by type and category of publication (peer vs. non-peer reviewed). Publications were collected by research entities for the applicable fiscal year and meet the following criteria: Books, book chapters, peer-reviewed publications inclusive of published journal articles, case reports, essays, literature reviews, e-journals, monographs and reports produced for government. See Figure 6 for a breakdown of total publications by agency and category of peer-reviewed vs non-peer reviewed. Peer review represents the gold standard for scientific credibility. 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 Percentage Peer vs. Non-peer Reviewed

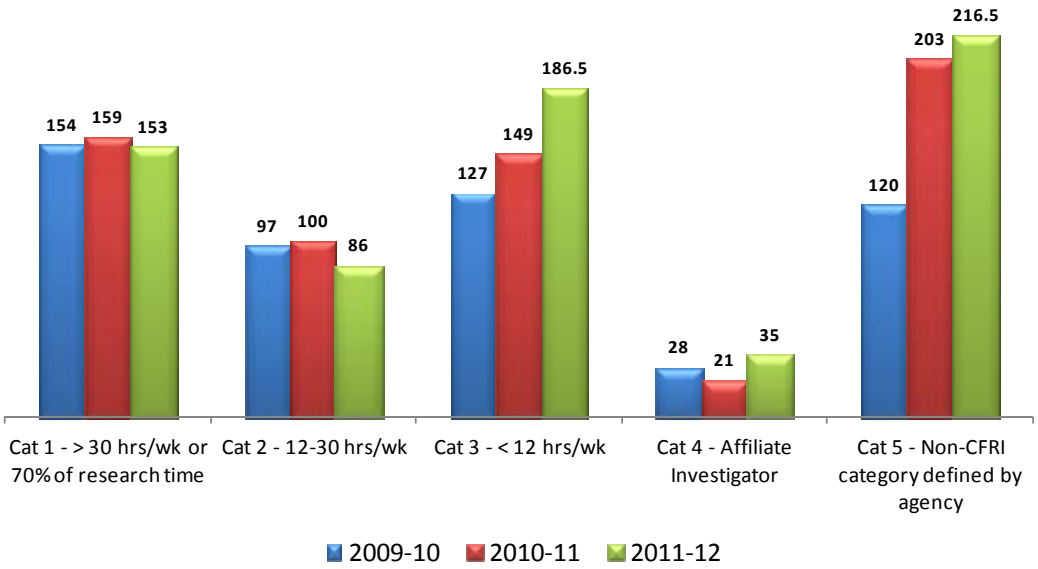


Building Research Capacity

PHSA research entities identified 677 researchers in 2011-12, up 44 from 2010-11 (see Figure 7). BCCA, BCMHARI and CFRI are able to report their researchers utilizing CFRI definitional categories, which highlight the amount of time protected for research purposes.

BCAS, 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



During FY 2011-12, PHSA researchers provided training and supervision to a total of 1,009 research trainees, a decrease of 12% (or 138) from FY 2010-11. This is a significant metric because the training of 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

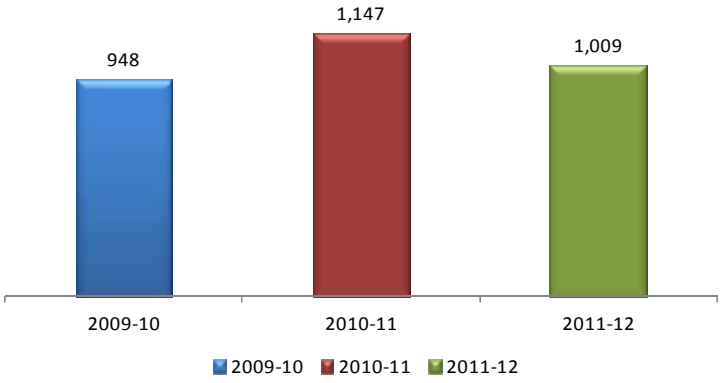
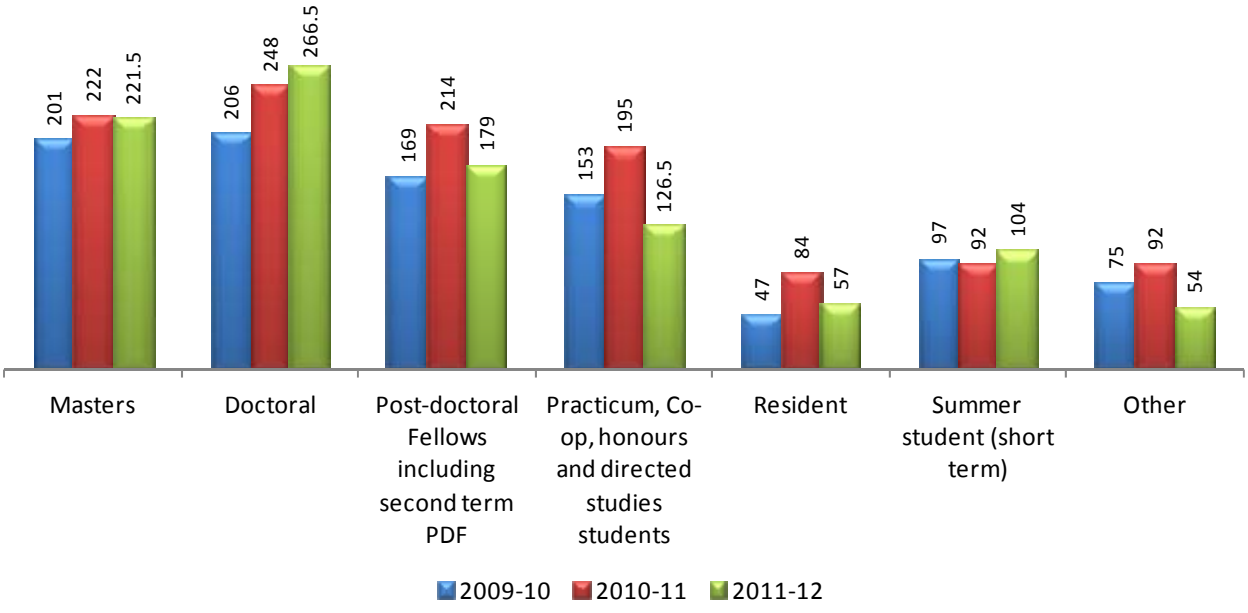


Figure 9
Total Number of PHSA Trainees by Type by Fiscal Year



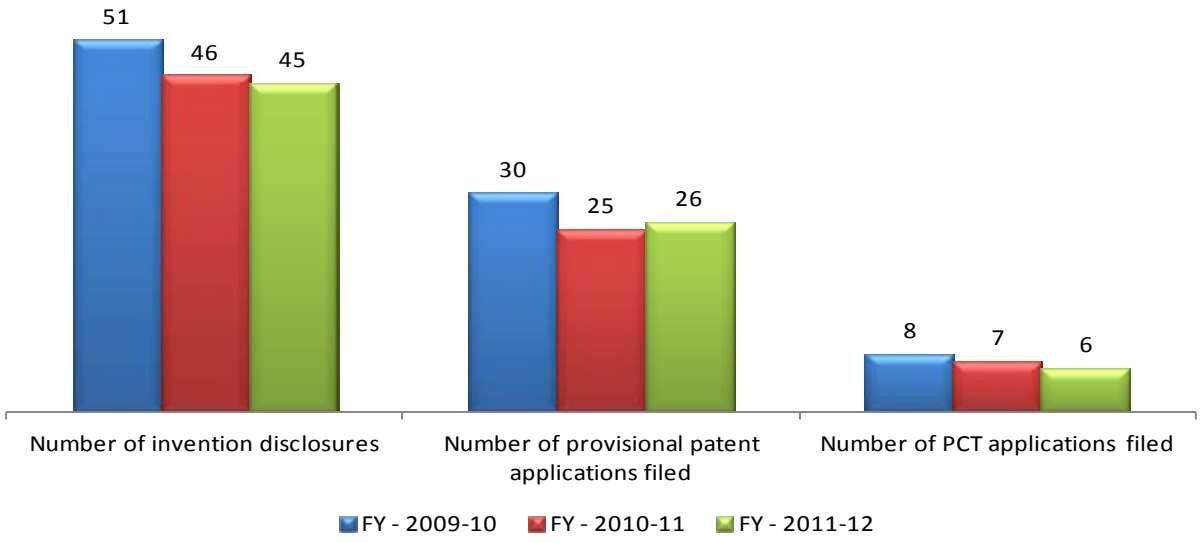
Achieving Economic Benefits and Innovation

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 and BCCDC (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 PCT applications filed by fiscal year. 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 gateway world-wide patents, each step involving greater specificity.

Figure 10

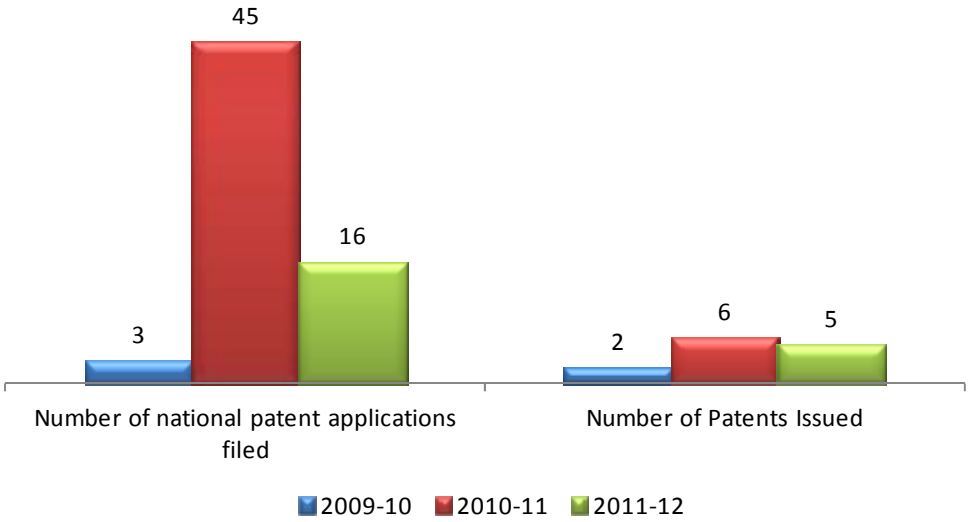
Total # of Invention Disclosures, Provisional Patent and PCT Applications Filed by Fiscal Year



Patents are reported in Figure 11 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).

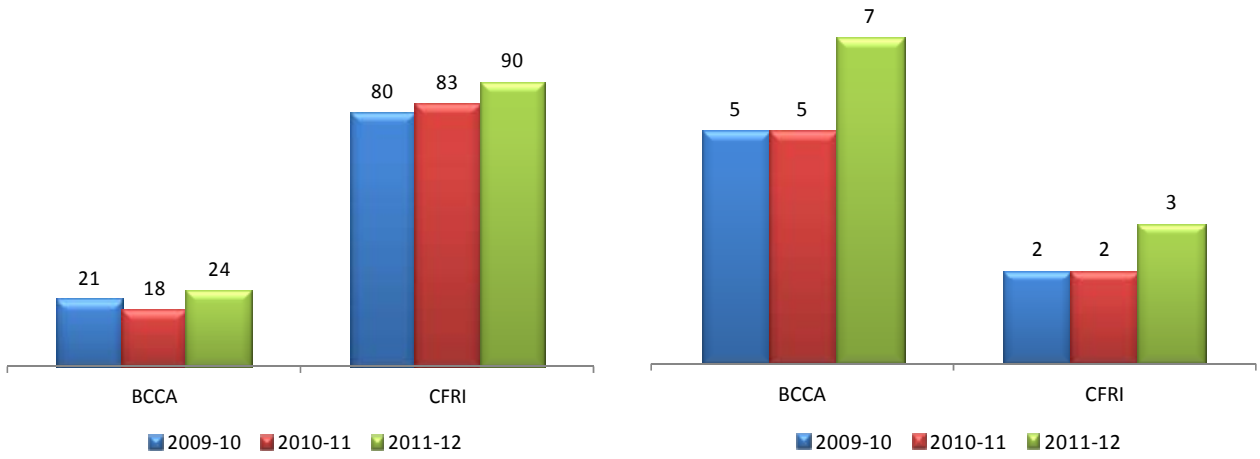
Figure 11

Total # of National Provisional Patent Applications Filed by Fiscal Year



Licensing agreements, as well as # of spin-off companies have increased for fiscal year 2011-12. (see Figure 12). Both License Agreements and Spin-off companies can expire during the fiscal year.

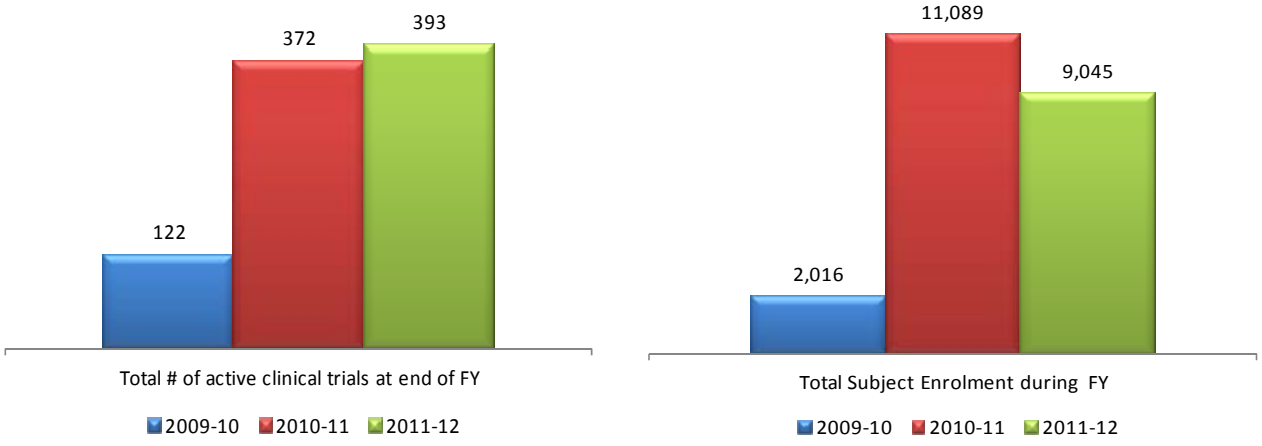
Figure 12
License/Assignment Agreements (left) and Spin-Off Companies (right) by Fiscal Year



Advancing Health and Policy Benefits

To measure advancement of health and policy benefits, PHSA is providing clinical trial data for three fiscal years. Collection of data is still challenging and inconsistent across sites. An increase in the number of clinical trials of 21 was experienced in FY 2011-12. Total subject enrolment in clinical trials across the Children's & Women's Oak Street site and the BC Cancer Agency during FY 2011-12 was 9,045 (see Figure 13). 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 Subject Enrollment by Fiscal Year



Achievements in advancing health and policy benefits were collected, for a third year, through a survey issued to all reporting entities. The survey asked respondents to identify guidelines, drugs, diagnostic agents or devices adopted or approved in 2011-12 as a result of research driven by PHSA researchers. 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. Specific survey responses are reported under each agency/reporting entity section and document important achievements in translational research.

BC Cancer Agency (BCCA)

Producing and Advancing Knowledge

In FY 2011-12, researchers affiliated with BCCA were awarded a total of $61,863,871 in research funding, a decrease of 10% from FY 2010-11, attributable to the impact of Major CFI grants. The amount awarded as Operating Grants ($53,456,909) makes up 78% of total funding received, and now include Clinical lab trial awards. A breakdown of funding types and subtypes, including and excluding major CFI grants, can be found in Figures 14 and 15. Total funding, excluding major CFI grants, remained largely unchanged.

Figure 14

Total BCCA Research Funding including Major CFI grants by Funding Type and Sub-type

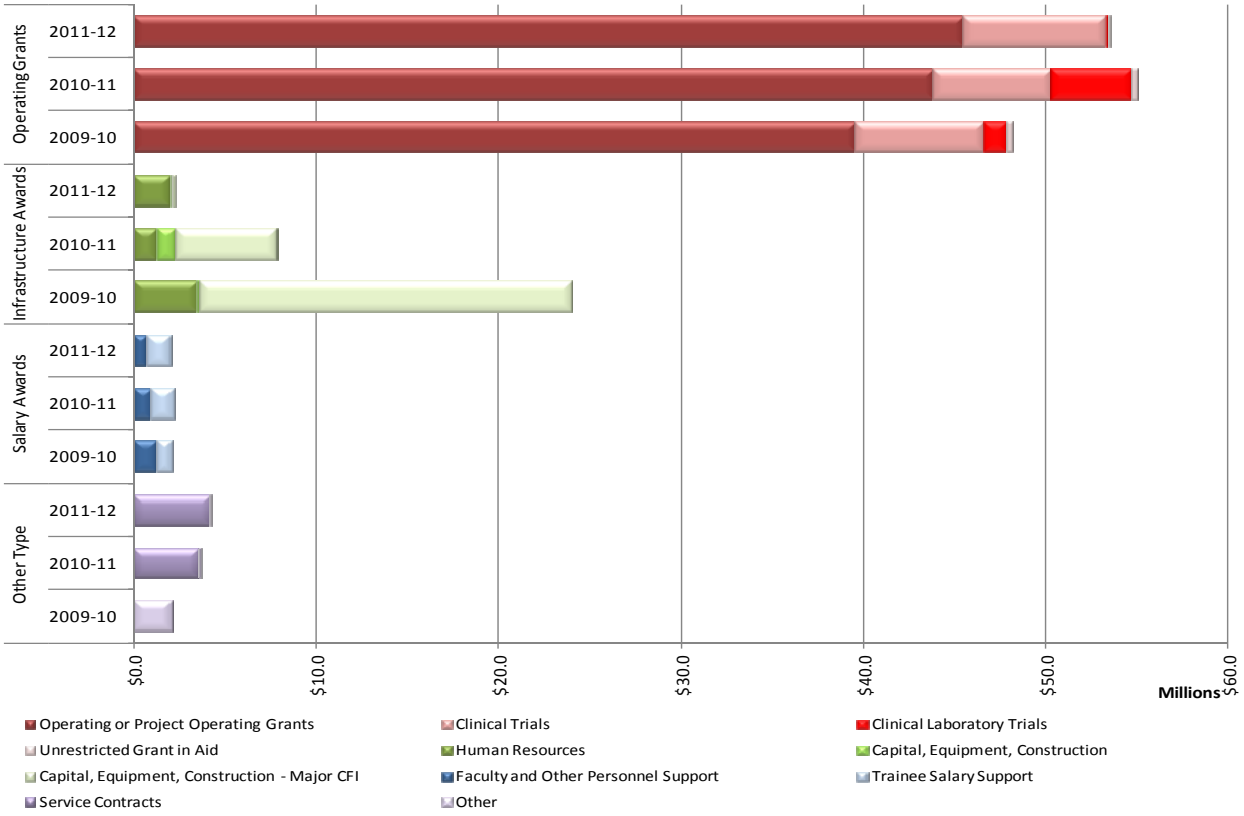
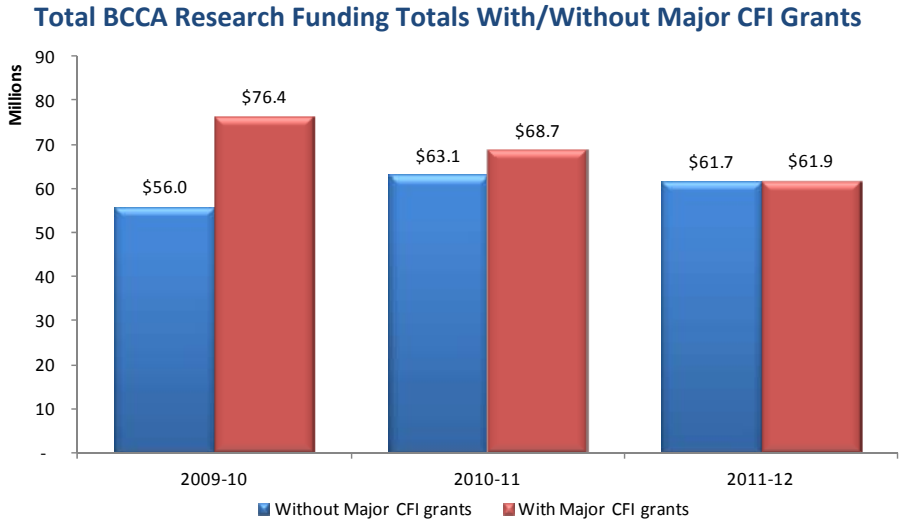


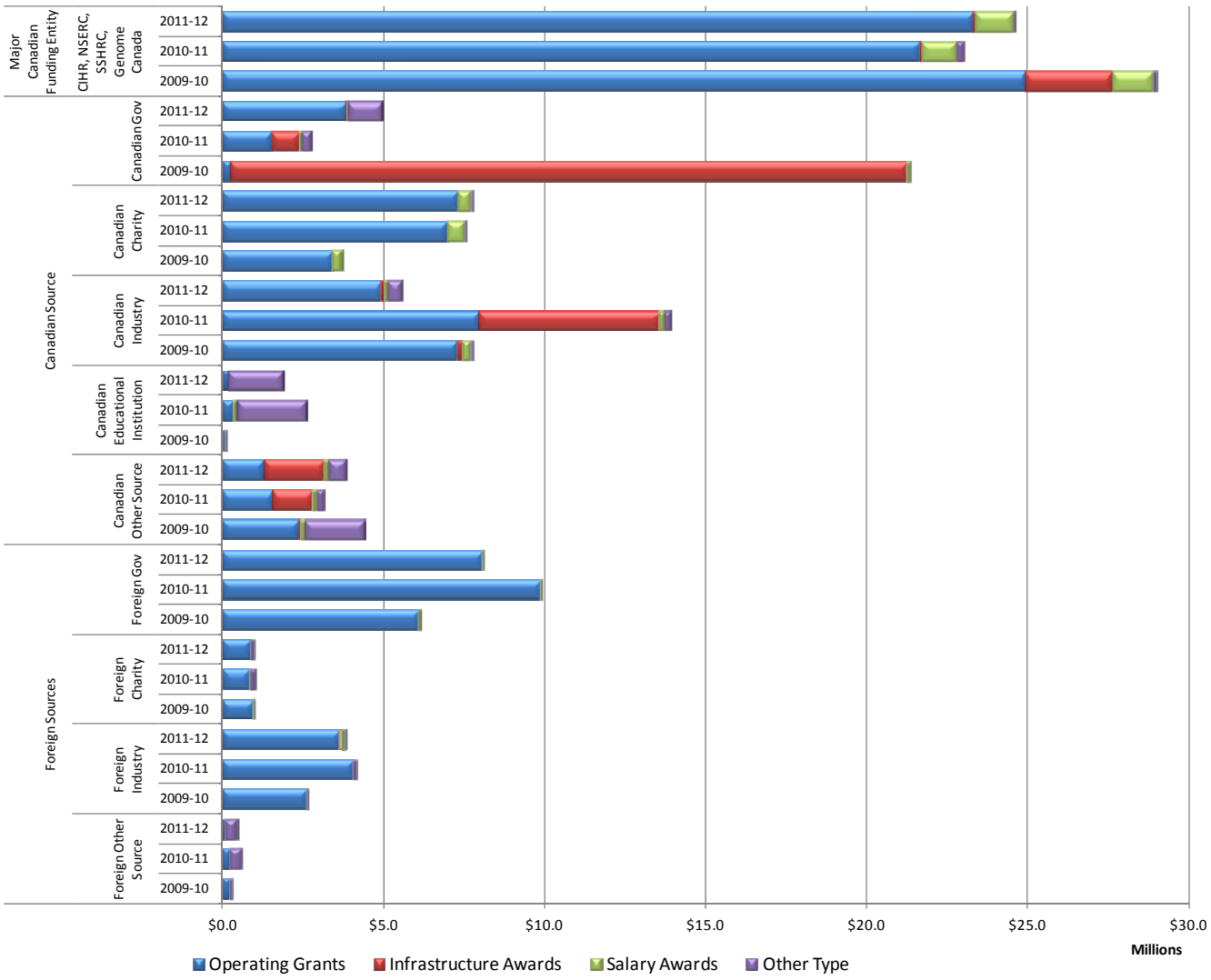
Figure 15



Of note is that Major Canadian Funding Entities proportion of total awards increased to 40% from 33.5% last FY for a total amount of $24,634,379. The top two funding sources after Major Canadian Funding Entity are Foreign Government (13%) and Canadian Charity (12%). Figure 16 details the major funding categories by funding type. Funding sources are detailed in Appendix 6.

Figure 16

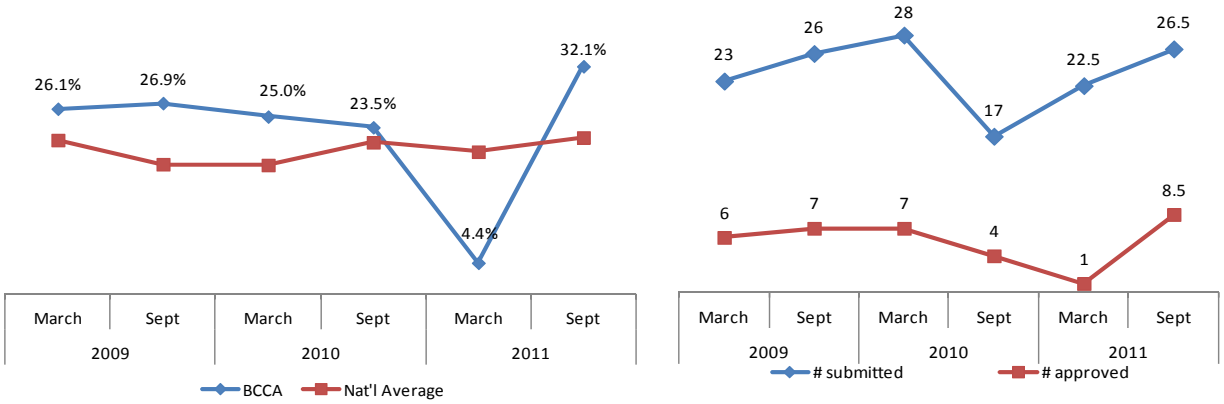
BCCA Research Funding, including Major CFI grants by Funding Source Category and Type



BCCA has demonstrated success in recent CIHR operating grant competitions, exceeding the national average for the Sept 2011 competition. Figure 17 below shows CIHR grant application success rates for BCCA compared to the national average as well as number of applications submitted and approved.

Figure 17

BCCA's CIHR Operating Grant Application Success Rate & Number of Applications Submitted/Approved



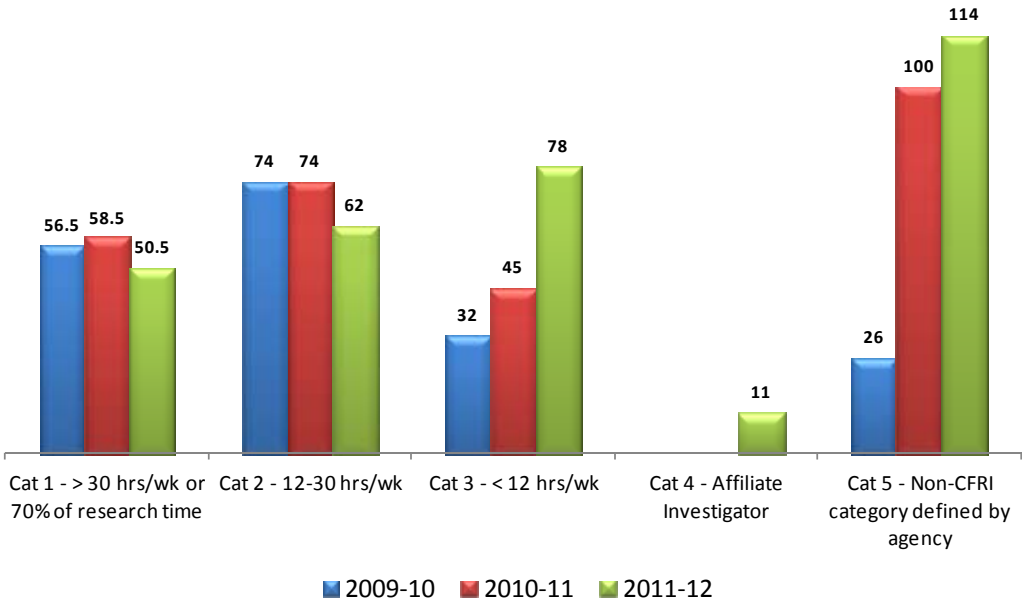
Total number of Publications by type and category of peer vs. non-peer reviewed, is collected for the first year in FY 2011-12. BCCA reported a total of 352 published journal articles all of which are peer reviewed. Peer review represents the gold standard for scientific credibility. The agency total represents the number for 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 one for each agency.

Building Research Capacity

BCCA has a total of 315.5 researchers in FY 2011-12 (up 38 from 2010-11). While adoption of the CFRI category classifications is in place, a significant amount (114) 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 18 for the number of researchers by category.

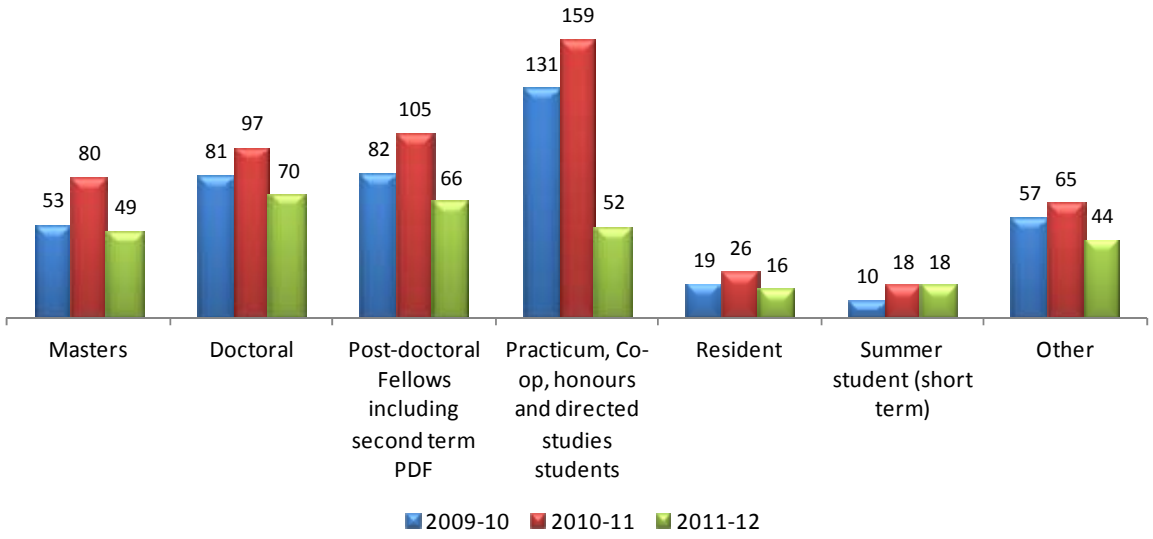
Figure 18

Total Number of BCCA Researchers by Category and Fiscal Year



During FY 2011-12, BCCA researchers provided training and supervision to a total of 315 trainees (down 235 from 2010-11). The largest decrease was seen in Masters (31) and Practicum, Co-op, honours and directed studies students (107). The Other category includes Research interns, Undergraduate Volunteers, a foreign MSc Intern, Visiting Students, Research Associates, Clinical Fellows, MD/PhD Students, and Post grad Nursing Students. See Figure 19 for the number of trainees by type.

Figure 19
Total Number of BCCA Trainees by Type and Fiscal Year

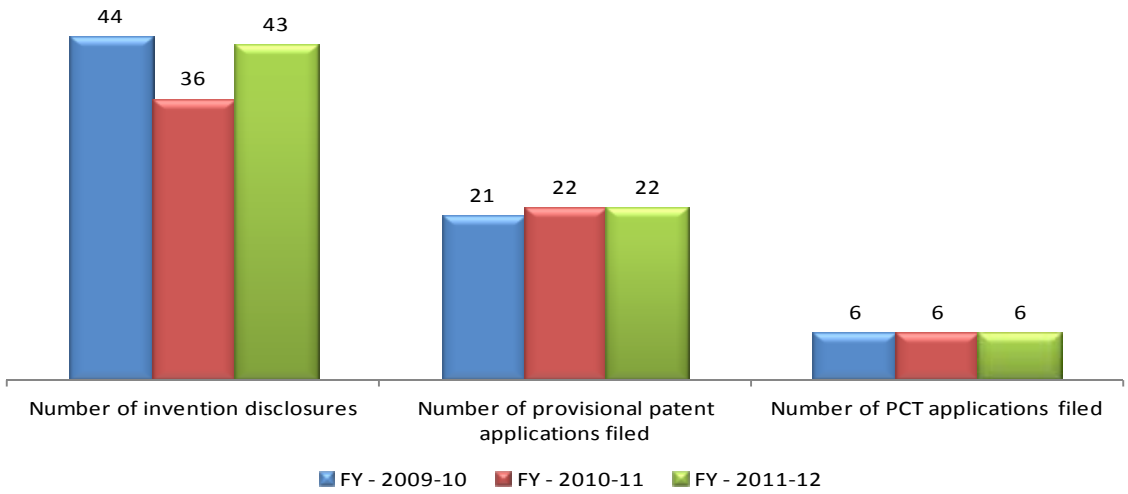


Achieving Economic Benefits and Innovation

BCCA Technology Development Office (TDO) Activities

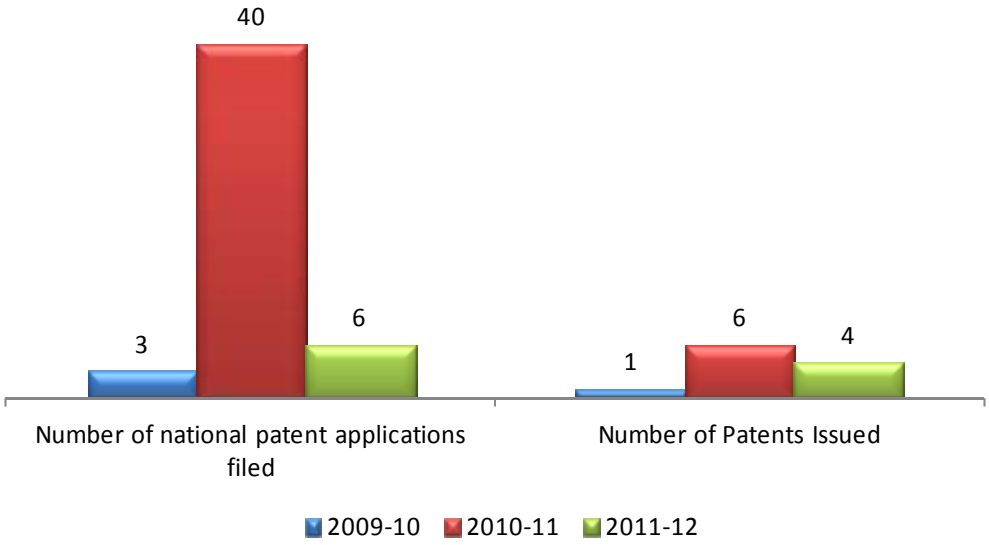
Patent Activity has remained relatively stable over the last three fiscal years. Invention disclosures are primarily internal BCCA documents, filed with TDO to inform the decision of whether or not to proceed with the patent process. The next stage in the patent process is to file provisional patent applications followed by patent cooperative treaties, or PCTs, which act as gateway world-wide patents. See Figure 20 for patent activity statistics.

Figure 20
BCCA TDO Invention Disclosures, Provisional Patent and PCT Applications by Fiscal Year



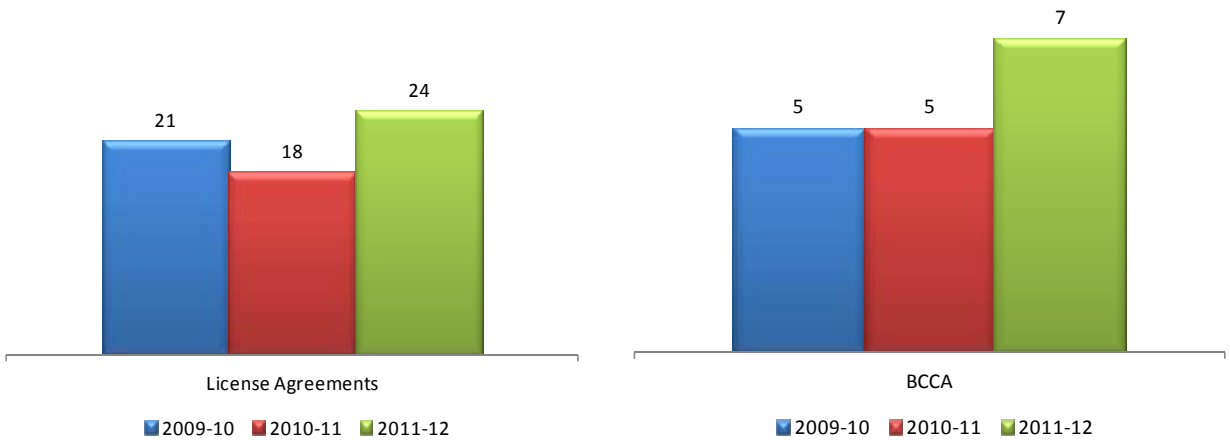
National patent applications are then filed with each step involving greater specificity. Patent applications filed in a given year represent different applications than those which are approved in that same year (which typically are the result of applications in previous years). The number of national patent applications filed last year was an anomaly associated with patenting of compounds for Essa Pharmaceuticals. See Figure 21 for a breakdown by Fiscal Year.

Figure 21
BCCA TDO National Patent Activity by Fiscal Year



In FY 2011-12, there were 24 (up 6 from last year) active license agreements (see Figure 22). There were two new spin-off companies created; MetaSignal Therapeutics, and Logipath Medical. Other active Spin-off companies include Aquinox Pharmaceuticals, Essa Pharmaceuticals, Repeat Diagnostics, Upstream Biosciences, and Verisante.

Figure 22
BCCA License Agreements (left) and Spin-Off Companies (right) by Fiscal Year



In FY 2010-11 members of the Research Metrics working group re-defined the reporting of IP related revenue in accordance with UBC (University Industry Liaison Office UILO) definitions (see Glossary – Appendix 4). See Table 1 for a comparison with last Fiscal Year. 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 1
TDO IP Related Revenue

IP Related Revenue	FY 2010-11	FY 2011-12
Royalties	$ 94,276.55	$ 588,335,85
Equity Liquidated	$ -	$ -
License Fees	$ 138,270.00	
License Management	$ -	
Option Fees	$ -	$ -
Technology Assignment	$ -	$ -
Gross Licensing Revenue (total)	**$ 232,546.55**	**$ 588,335.85**
Expenses for patenting, legal & related costs	$ 121,570.00	$ 233,109.39
Net Licensing revenue	**$ 110,976.55**	**$ 355,226.46**
Realized Revenue per distribution agreement	$ 21,585.04	$ 70,334.84

Advancing Health and Policy Benefits

BCCA manually collects the total number of accrued (or enrolled) patients to clinical trials. Table 2 presents the numbers of patients accrued/enrolled in each of fiscal years 2009-10, 2010-11 and 2011-12. While the # of trials increased by 28, total subject enrollment remained relatively stable.

Table 2
BCCA Clinical Trials

	09-10	10-11	11-12
Total Number of Clinical Trials active during the FY		252	280
Status of the Trial as of March 31 in the FY:			
Total Number of Active Trials		224	225
Total Number of Trials that closed during the FY		28	55
Enrolment Numbers:			
Expected Local Subject Enrolment (for the term of the study)		34,829	35,088
Total Subject enrolment to March 31 of the FY		23,382	28,082
Total Subject enrolment during the period April 1 to March 31 of the FY	899	8,934	5,639

Following are key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2011-12 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 3
BCCA Outcome Survey Responses

Guideline, drug, diagnostic agent, or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	**Benefits to patients, population health, and/or health system sustainability of the items identified**
The Aura Devise, by Verisante, for skin cancer detection using optical spectroscopic techniques received Health Canada Approval as well as European CE mark.	The Verisante Aura series is a novel multimodality imaging and spectroscopy system designed to aid in the early detection of skin cancer. The system provides valuable information about the chemical composition of the skin quickly and non-invasively. Verisante Aura scans for 21 different cancer biomakers in less than one second; providing immediate, accurate results. Recognized in Popular Science magazine as a top technology innovation for 2011 receiving one of the magazines "Best of What's New" awards.
The VEL Scope for oral cancer surgical field determination is an approved application which in the calendar year 2011-12 is involved in a Pan Canadian, 1-centre, randomized trial which, if successful, will improve the adoption rate of fluorescence visualization for oral surgery.	The use of fluorescence visualization through the VELScope device for oral cancer surgical field determination, reduces local oral cancer 3 year recurrences rates from ~30% to t ~6% as well as reducing nodal metastasis rates and early evidence suggests even mortality rates for oral cancer.
BCCA Scientist Gerry Krystal presented new lab based research showing that a low-carb, high-protein diet slows cancer growth and may actually prevent cancers from forming. These results were published in Cancer Research.	This diet has the real potential to improve overall health, reduce cancer risk and provide benefit to those living with cancer by slowing tumour growth. A simple change in diet could have a significant impact on cancer growth rate and overall risk.
BCCA Scientists Stephen Lam and Haishan Zeng have shown that Laser Raman Spectroscopy (LRS) technology offers a significant improvement in the accuracy and specificity in detecting lung cancer. This study was published in Journal of Thoracic Oncology.	By adding LRS testing with the current detection methods of White Light Bronchoscopy (WLB) and Autofluorescence Bronchoscopy (AFB), pre-neoplastic lesions were detected with a sensitivity of 96 percent and a specificity of 91 percent. The use of LRS has great potential for reducing the number of false-positive biopsies associated with WLB and AFB with very little reduction in the detection sensitivity.
BCCA Scientists released promising clinical trial results in treating women with high-grade serous ovarian cancer with PARP inhibitors. This study was published in The Lancet Oncology.	BCRA is a germline genetic mutation related to breast and ovarian cancer. For the first time Scientists and Clinicians were able to reduce tumour size in patients who have been identified with this gene mutation (BCRA positive) and patients without the genetic mutation. This study provides compelling evidence to warrant further clinical trials in this patient population as Clinicians and Scientists seek to find more effective treatment options for patients with non-hereditary forms of ovarian cancer.
BCCA Scientist Mary McBride led the BC arm of a study on mobile phone use and cancer risk. The study found no increase risk of acoustic neuroma (a rare cancer of the head) among those who have used a mobile phone for 10 years or longer. These findings were published in Cancer Epidemiology.	As cell phone usage has increased, so have concerns about possible health risks. This study does not support the idea of an increased risk of acquiring acoustic neuroma from using cell phones. But – it is important to continue this type of research and examine high exposure groups, especially long-term heavy users.

Child & Family Research Institute (CFRI)

Producing and Advancing Knowledge

In FY 2011-12, researchers affiliated with CFRI were awarded a total of $56,333,705 in research funding, a 7% decline from last FY. The amounts awarded as Operating Grants ($37,009,744) and Salary Awards ($9,349,750) make up approximately 82% of total funding received. A breakdown of funding types and subtypes can be found in Figure 23. Figure 24 shows that, while overall funding decreased, it was due in part, to the exclusion of any Major CFI Infrastructure grants awarded for FY2011-12.

Figure 23

Total CFRI Research Funding including Major CFI grants by Funding Type and Sub-type

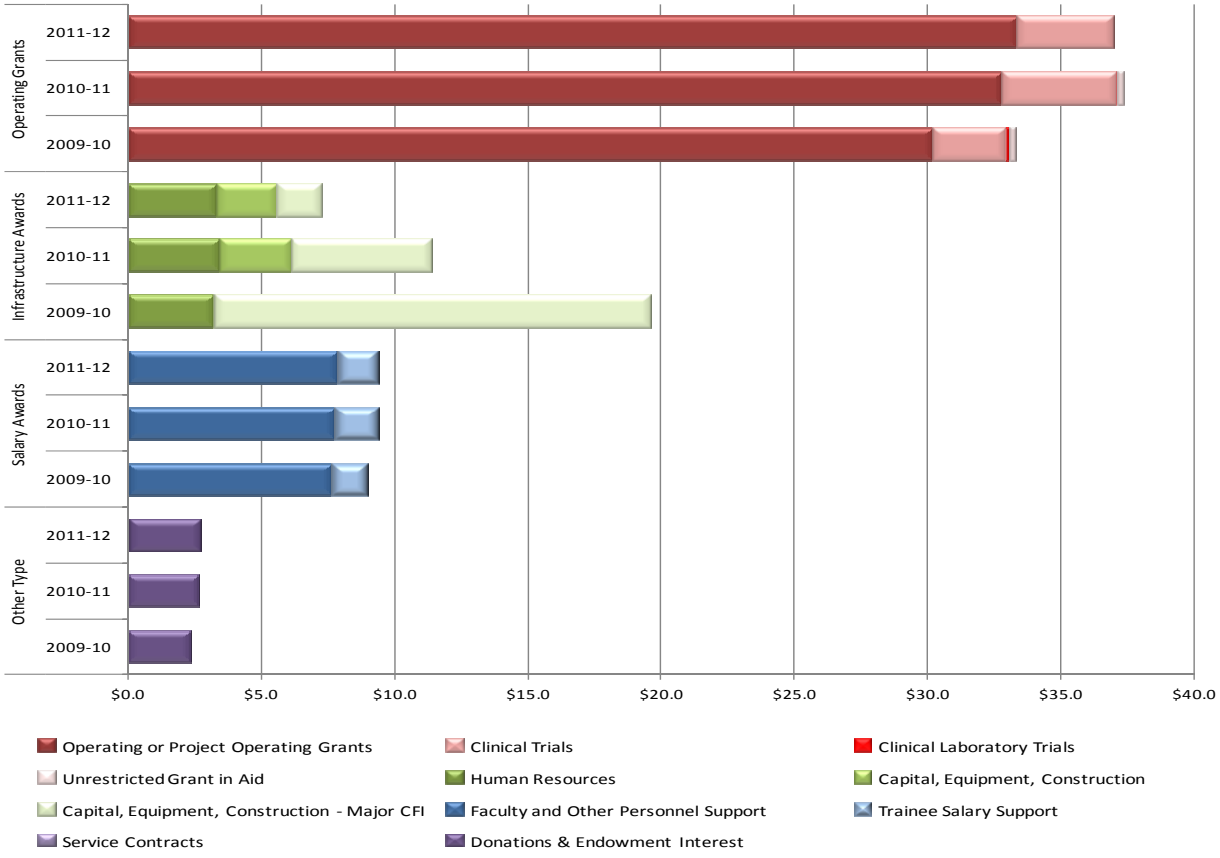
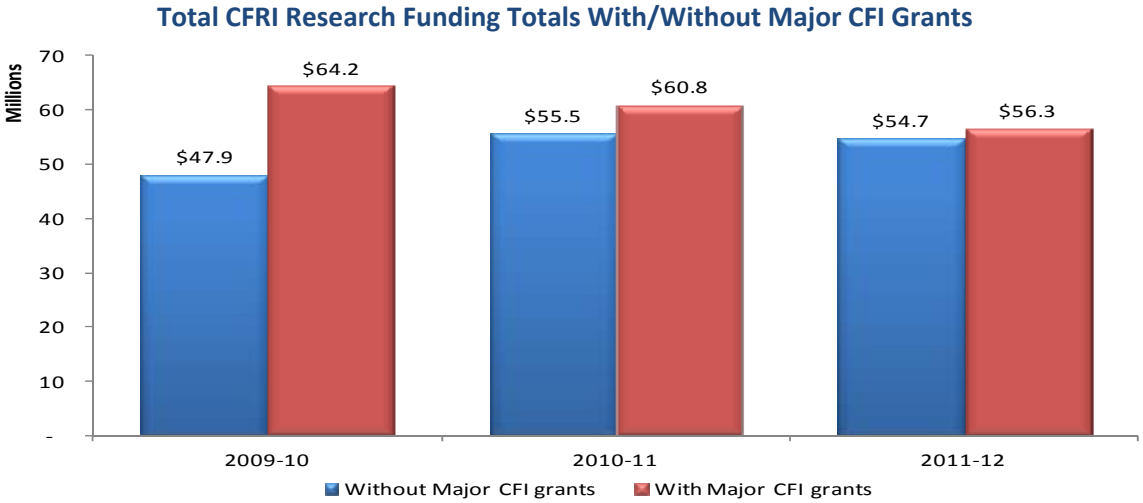


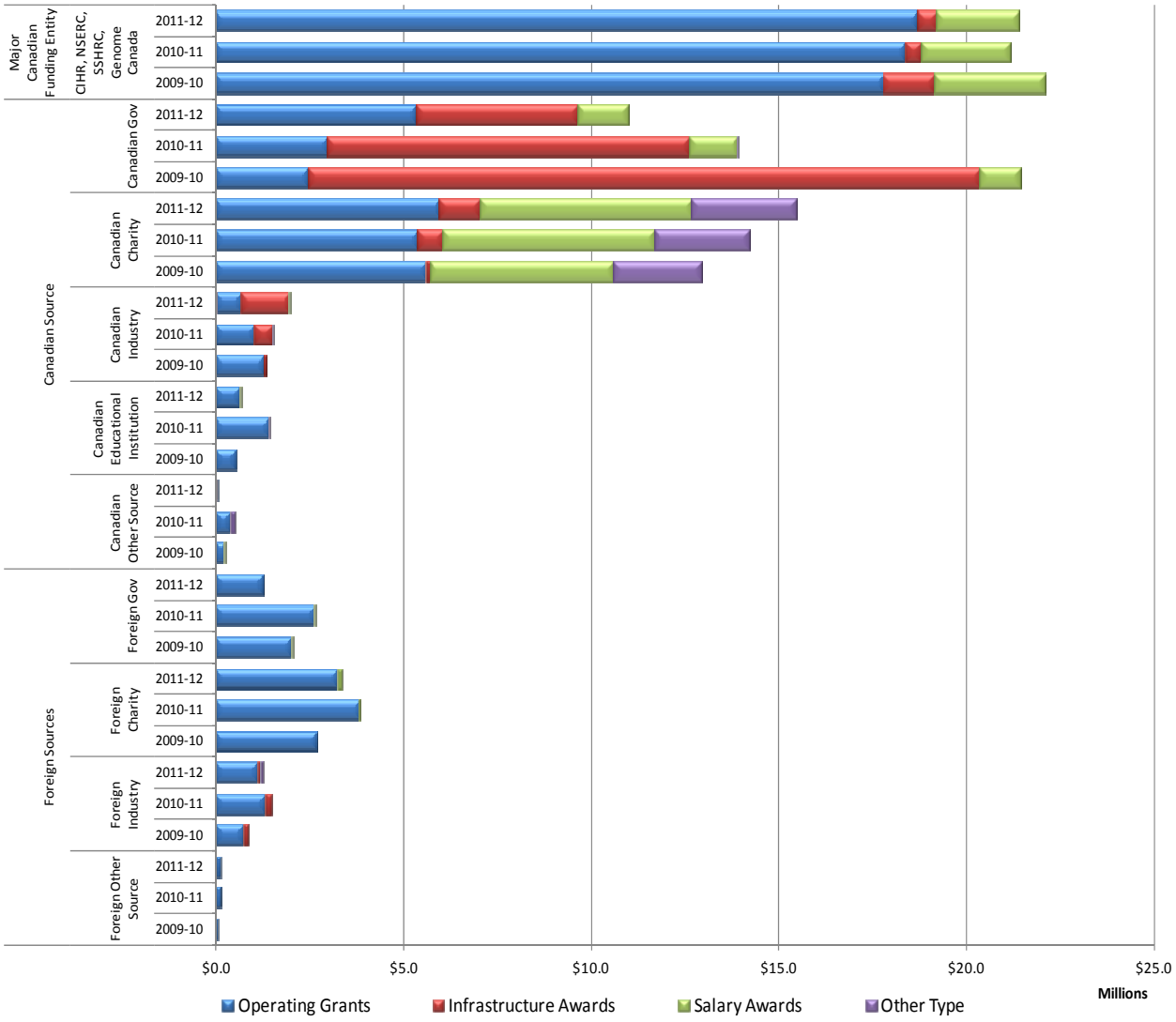
Figure 24



The top three funding categories are Major Canadian Funding Entity (38%), Canadian Charity (27%) and Canadian Government (20%). Figure 25 details the major funding categories by funding type. Funding sources are detailed in Appendix 7.

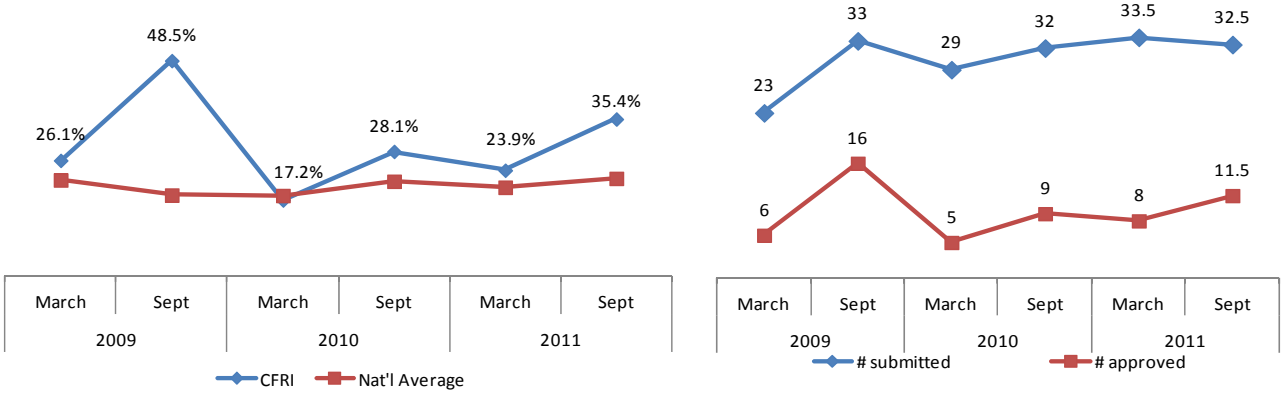
Figure 25

CFRI Research Funding, including Major CFI grants by Funding Source Category and Type



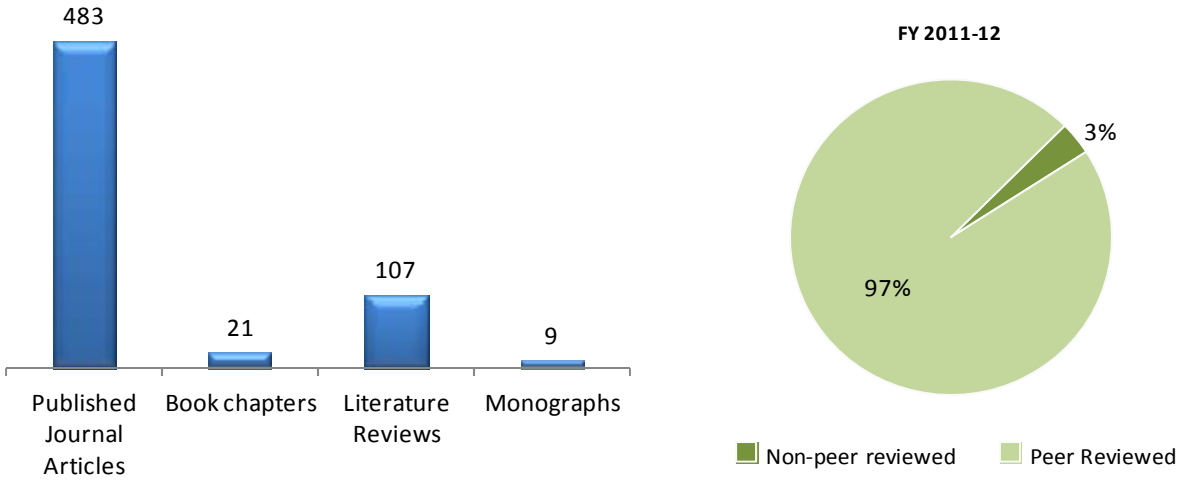
CFRI has demonstrated success in recent CIHR operating grant competitions, exceeding the national average in both competitions in FY 2011-12. Figure 26 below shows the revised competition results (which occur in instances when, after the initial funding announcement, one of the CIHR Institutes decides to support highly ranked applications that have just missed the cut-off by providing a bridging award) and number of applications submitted and approved.

Figure 26
CFRI's CIHR Operating Grant Application Success Rate & Number of Applications Submitted/Approved



Total number of Publications by type and category of peer vs. non-peer reviewed, is collected for the first year in FY 2011-12. See Figure 27 for a breakdown by type and category. Peer review represents the gold standard for scientific credibility. The agency total represents the number for 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 one for each agency. CFRI accepts case reports, essays, e-journals and government proceedings but they do not categorize them into these subcategories.

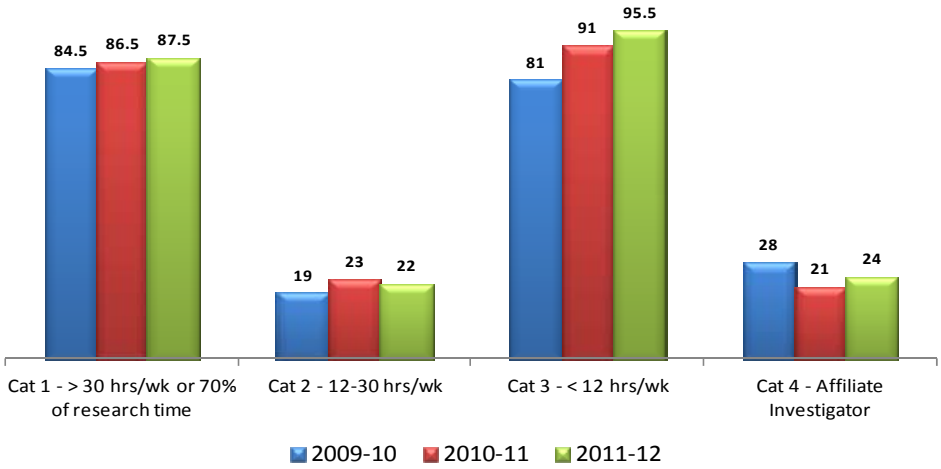
Figure 27
Total Number of CFRI Publications by Type and Category



Building Research Capacity

CFRI has a total of 229 researchers. The distribution of these researchers is represented in Figure 28 below. Researchers in categories 1 to 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 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.

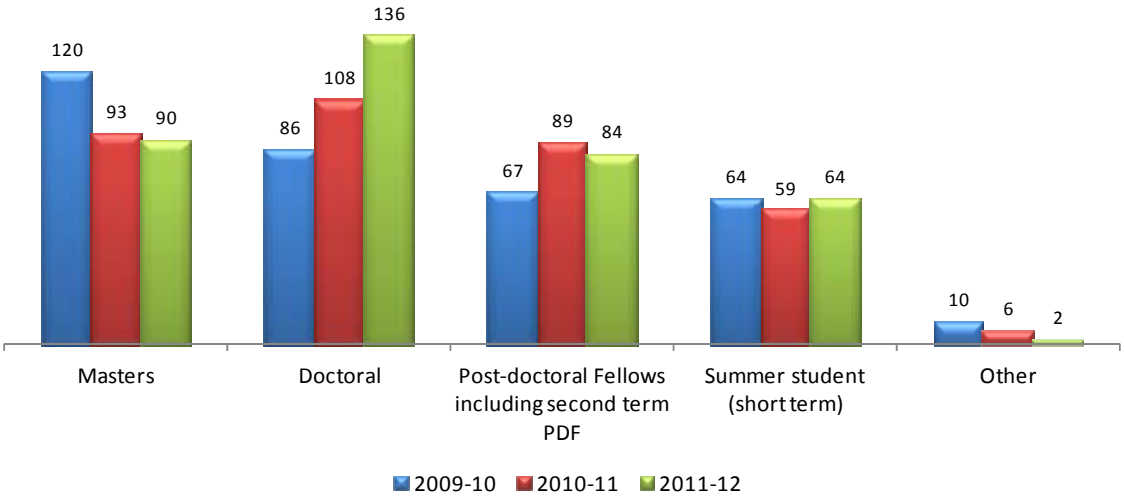
Figure 28
Total Number of CFRI Researchers by Category



During FY 2011-12, CFRI researchers provided training and supervision to a total of 376 (up 21 from 2010-11) trainees. This includes 136 Doctorals, an increase of 25% over FY 2010-11 levels; 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 are 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

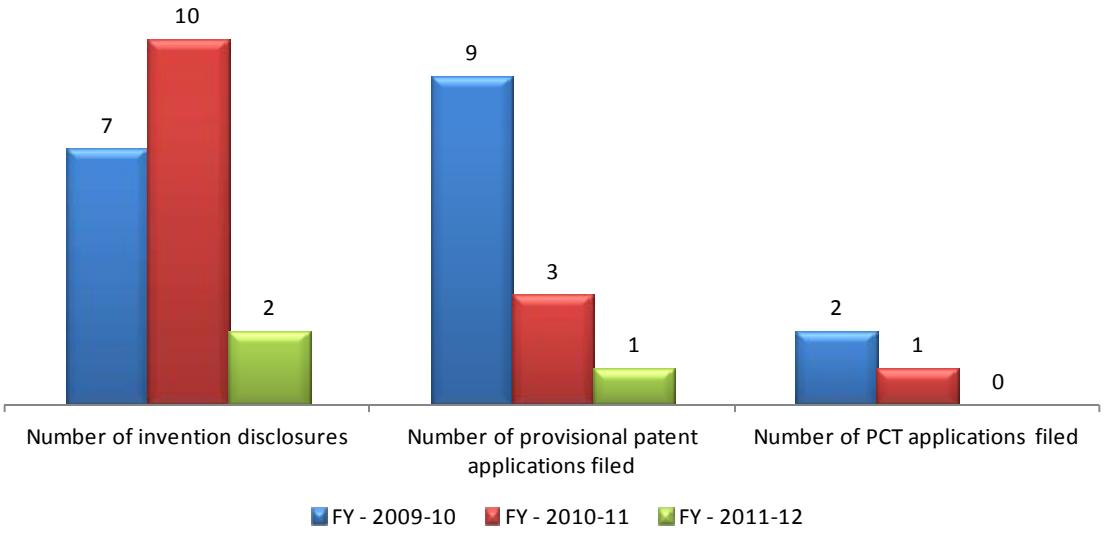


Achieving Economic Benefits and Innovation

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

Figure 30

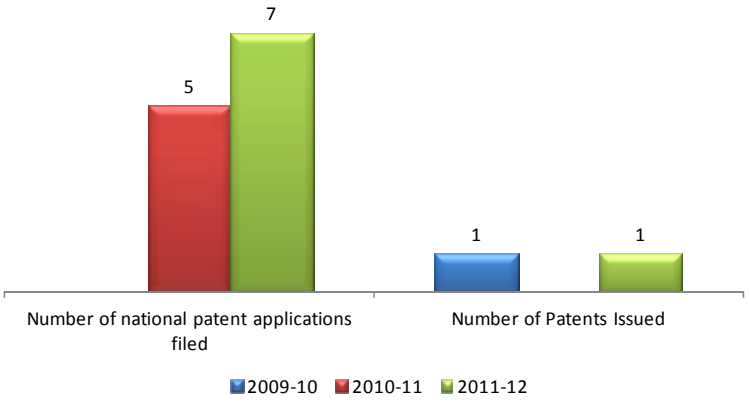
CFRI Invention Disclosures, Provisional Patent and PCT Applications Filed by Fiscal Year



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).

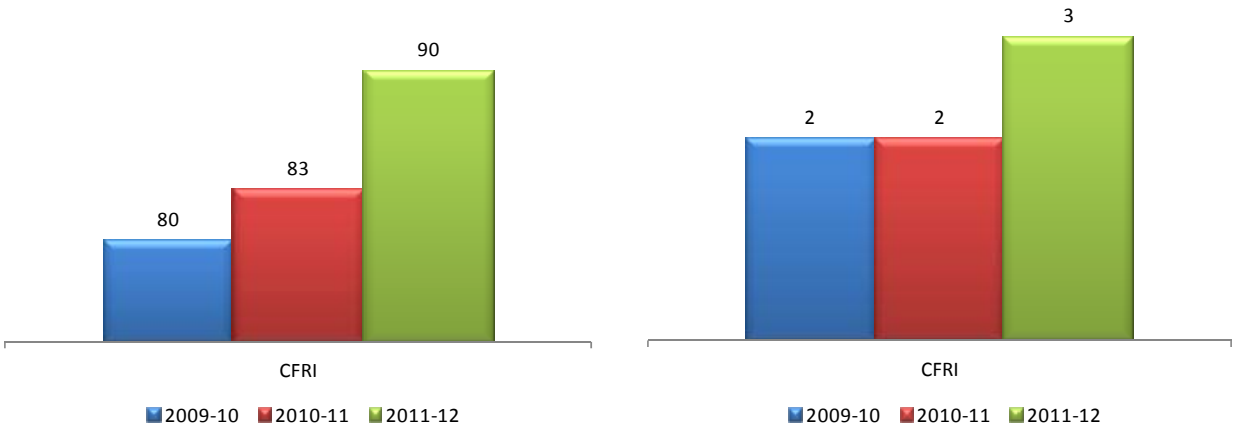
Figure 31

CFRI National Patent Activity by Fiscal Year



In FY 2011-12 there were 90 active license/assignment agreements in place (See Figure 32). Currently, three spin-off companies have been created. CFRI holds shares in four companies – Urodynamix Technologies (publicly traded), BCY Lifesciences (publicly traded), and Lions Gate Technolgoies. Xenon Pharmaceuticals (private) is held in trust by UBC so is not included in the totals below.

Figure 32
CFRI License/Assignment Agreements (left) and Spin-off Companies (right) by Fiscal Year



In FY 2010-11 members of the Research Metrics working group re-defined the reporting of IP related revenue in accordance with UBC (University Industry Liaison Office UILO) definitions (see Glossary). See Table 4 for CFRI FY 2011-12 data. For CFRI, UILO covers all patent, legal and related costs prior to distribution of any revenue amounts. As a result, CFRI is only able to report net licensing revenue, per the distribution agreement, not Gross. Currently, there is a cumulative net loss of revenue of $664,900. Until UBC has recovered all of their Patent and Legal costs on a file by file basis there is no distribution of revenues to C & W.

Table 4
CFRI IP Related Revenue

IP Related Revenue	FY 2010-11	FY 2011-12
Royalties	$ 7,833.33	5,617.00

Equity Liquidated	$	-	
License Fees	$	-	
License Management	$	-	
Option Fees	$	-	
Technology Assignment	$	24,723.66	
Gross Licensing Revenue (total)	**$**	**32,556.99**	**5,617.00**
Expenses for patenting, legal & related costs	$	-	
Net Licensing revenue	**$**	**32,556.99**	**5,617.00**
Realized Revenue per distribution agreement	$	32,556.99	

Advancing Health and Policy Benefits

The challenge in reporting clinical trial information is that there is no central mechanism to capture information about active clinical trials on the C&W site. For the purposes of this report, data are based on RISe database files that answered "yes" to question 7.11 (a) (Registration for Publication of Clinical Trials) on an application form. Research Coordinators and Managers (PIs, when necessary) were then contacted to obtain enrolment numbers. The majority of clinical trials are likely included in this data (thanks to the network of coordinators/managers recently put in place) but it is possible that some trials have been missed (see Table 5)

Table 5
CFRI Clinical Trials

	09-10	10-11	11-12
Total Number of Clinical Trials active during the FY	118	161	174
Status of the Trial as of March 31 of FY			
Total Number of Active Trials	104	127	147
Total Number of Trials that closed during the FY	14	34	27
Enrolment Numbers:			
Expected Local Subject Enrolment (for the term of the study)	4,338	8,403	5,458
Total Subject enrolment to March 31 of the FY	1,974	4,105	4,015
Total Subject enrolment during the period April 1 to March 31 of the FY	684	1,172	2,075

The following table 6 reflects a sample of key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2011-12 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 6
CFRI Outcomes Survey Responses

Guideline, drug, diagnostic agent, or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	Benefits to patients, population health, and/or health system sustainability of the items identified
CFRI investigators have found that painful medical procedures are associated with slower brain growth in preterm infants.	The MRI scans allowed researchers to evaluate the infants' brain development by measuring a special molecule that increases as brain cells mature, and by assessing the rate of water movement within the brain, which becomes more organized as the brain develops. They found that babies who had more skin-breaking procedures had lower levels of the molecule and less organized water movement, which revealed impaired brain development. The neonatologists and nurses in the NICU have introduced systematic procedural pain management for the preterm infants, as a result of our research findings,
CFRI clinician-scientist Dr. David Speert has collected and stored bacteria that cause devastating infections in children and adults with cystic fibrosis (CF). Dr. Speert founded the CF Repository in 1981 and today it contains over 14,000 samples of two types of frozen bacteria.	Understanding the bacteria *Pseudomonas aeruginosa* and *Burkholderia cepacia complex* is critical to finding ways of helping children and adults with CF overcome deadly lung infections. Highlights of research discoveries from the Cystic Fibrosis Repository include: • Determining key features of *Pseudomonas* bacteria that are unique to CF lung infections. • Discovering some of the science that informed new Canadian infection control guidelines that decreased transmission of *Burkholderia* among children and adults with CF. • Designing a new method for identifying *B. cepacia* in the laboratory. This method made it faster to detect the bacteria, which allowed doctors to treat infections in CF patients sooner and to determine whether a patient needed to be isolated from other patients. This method was later recommended by *The Manual of Clinical Microbiology* to CF clinics worldwide as the most effective way to identify *B. cepacia*. • Finding a genetic marker for several strains of *B. cepacia*, which allowed scientists to recognize which strains were more harmful to people with CF, leading to more personalized treatments. • Understanding the biology that explains why *Burkholderia* can survive some of the most powerful antibiotics. Discovering that using a specific antibiotic to treat patients infected with a specific strain of *B. cepacia* can increase the bacteria's resistance to other antibiotics. This could help clinicians determine the type of treatment that would be most effective for CF patients who have this strain of bacteria.
Canadian study shows international ranking system for	The research shows that surveys on perinatal, infant and

Guideline, drug, diagnostic agent, or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	Benefits to patients, population health, and/or health system sustainability of the items identified
infant mortality is flawed.	child mortality rates conducted by the United Nations Children's Fund and the Organization for Economic Cooperation and Development (OECD) are biased because many countries fail to register all babies, especially those born very small or too early. The researchers say that birth registration should be standardized in order to fully understand infant health status in industrialized countries.
New research shows steroid medications associated with impaired brain development in premature infants.	The cerebellum is the part of the brain associated with balance, motor learning, language and behaviour. Investigators found that premature babies given steroid medication (hydrocortisone or dexamethasone) had cerebellar volumes that were, on average, 10 per cent smaller by term age than premature babies who did not receive the medications.
Researchers propose new model for child safety campaigns.	They suggest that public health programs emphasize both injury prevention and the safe introduction of new experiences, which are important for children's physical and psychological development. They note that more research is needed to validate the new model, examine its association with injuries, and to identify the ideal balance between encouraging healthy risk-taking while minimizing the potential for injuries.
A team of researchers led by Dr. Bruce Verchere found a way to block internal immune attack and prevent type 1 diabetes in mice. The researchers increased a protein called CCL22 in the mice's insulin-producing beta cells. This protein attracted other protective cells that blocked the immune attack and prevented diabetes.	CFRI's discovery could lead to a drug that prevents the progression of type 1 diabetes in people newly diagnosed with the disease. It could also lead to new drugs for overcoming organ rejection in transplant patients.
CFRI scientists and investigators contributed to national recommendations for clinicians on monitoring and managing the care of children who take drugs prescribed for schizophrenia and mood disorders, among other diagnoses.	As a result of these findings, the Provincial Health Services Authority opened a Provincial Mental Health Metabolic Clinic at BC Children's Hospital to help these children before they develop serious health issues.
A CFRI research team made an important step in understanding why certain immune cells fail in autoimmune diseases such as diabetes, lupus, and colitis.	Understanding the details of how T-regulatory cells work and the role of PHLPP will help researchers develop new drugs for children who have autoimmune disease and improve drugs for preventing immune rejection of organ transplants.

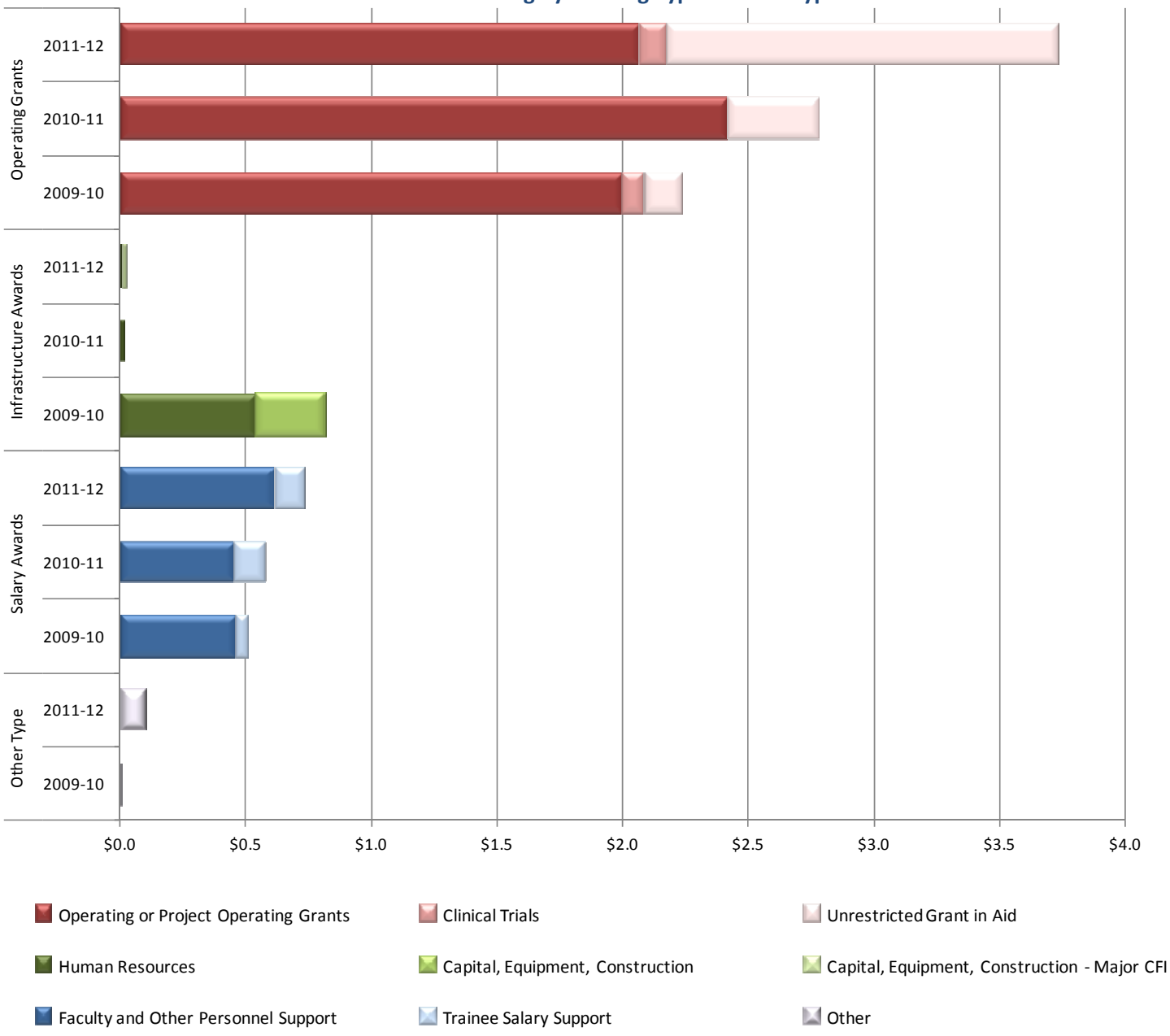
BC Mental Health and Addictions Research Institute (BCMHARI)

Producing and Advancing Knowledge

In FY 2011-12, researchers associated with BCMHARI were awarded a total of $4,579,225 and increase of 28% from FY 2010-11. The amount awarded as Operating Grants ($3,730,252) and Salary Awards ($730,042) in FY 2011-12, make up 97% of total funding received. A breakdown of funding types and subtypes can be found in Figure 33. BCMHARI saw funding increases in the area of faculty salary support, clinical trials, and project operating grants, with the most significant increase driven by a large increase in the number of grants in aid received in FY 2011-12. This included several large grants in support of a genetic counselling project, a study on co-occurring psychosis, mental illness and viral infection, and the establishment of an Obsessive Compulsive Disorder (OCD) Centre of Excellence.

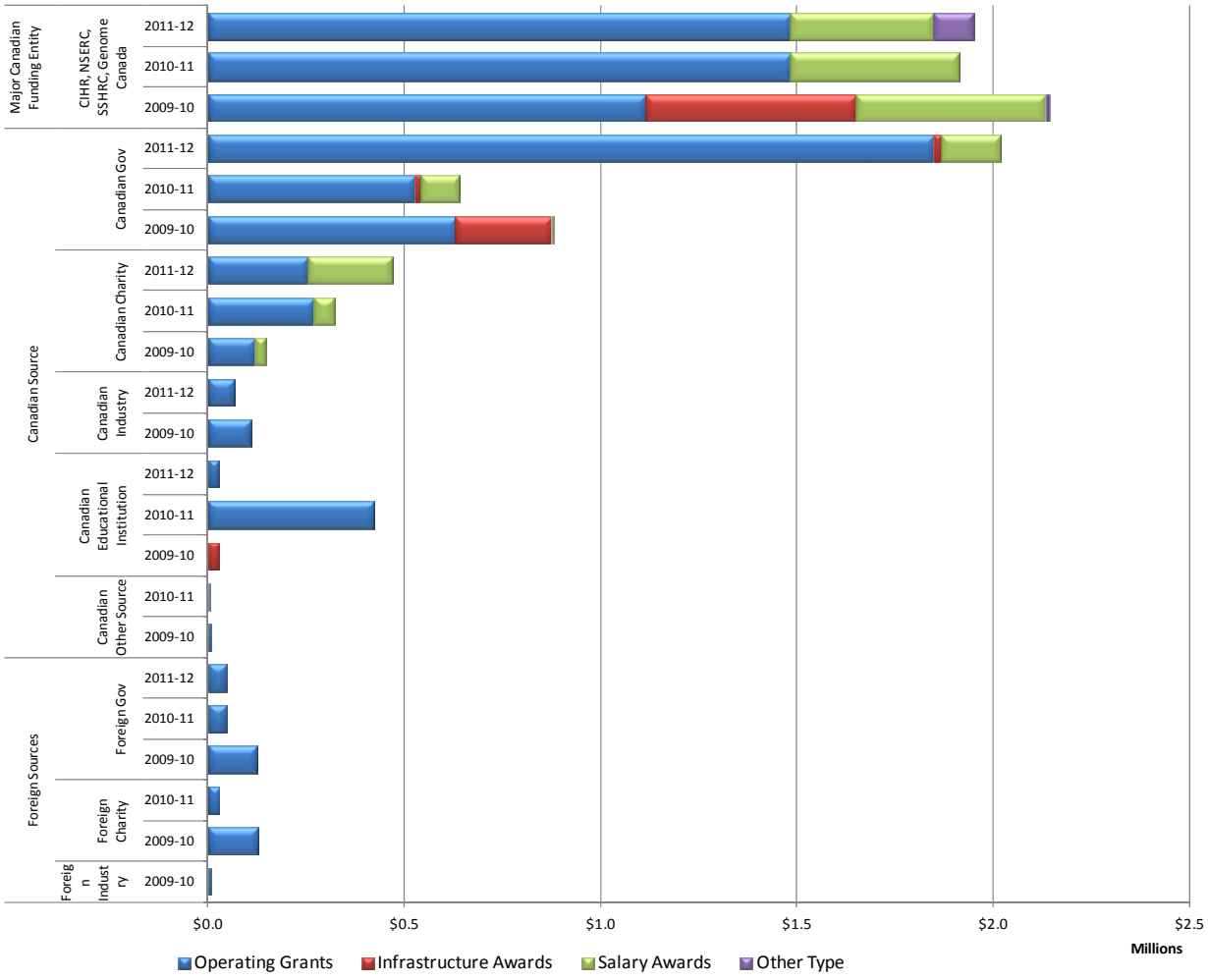
Figure 33

BCMHARI Research Funding by Funding Type and Sub-type



The top two funding categories are Canadian Government (44%) and Major Canadian Funding Entity (43%). Figure 34 details the major funding categories by funding type. A complete list of funding sources is detailed in Appendix 8.

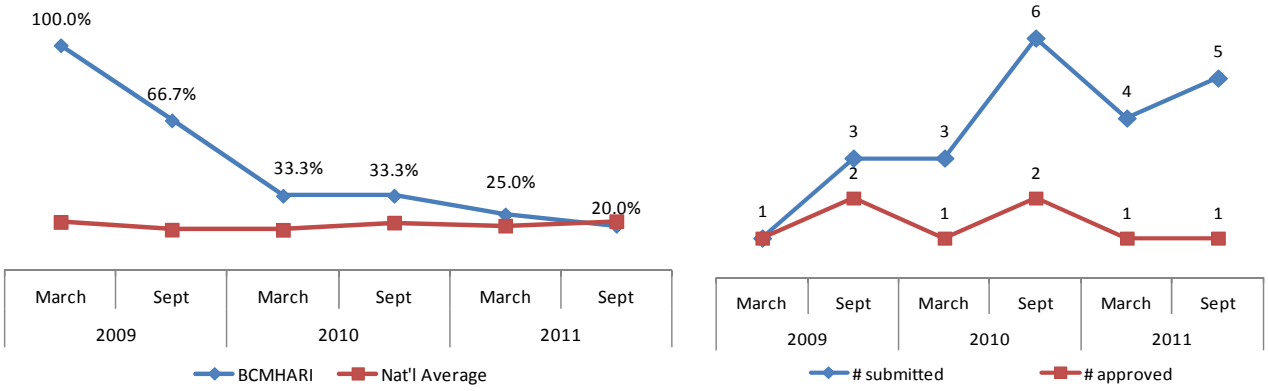
Figure 34
Total BCMHARI Research Funding by Funding Source and Type



BCMHARI has demonstrated success in recent CIHR operating grant competitions, exceeding the national average in the March operating competition. Figure 35 below shows competition success rates and number of applications submitted and approved. The success rate is directly related to the number of CIHR funding applications submitted. While the graph suggests a decline in performance from 2009-10 to 2011-12, the drop in the success rate is driven by an increase in the number of funding applications submitted. BCMHARI's success rate was highest in 2009-10 when 3 of 4 applications were successful. Three applications were successful in 2010-11 as well however the number of applications submitted had more than doubled (9). In 2011-12, 9 applications were submitted, 2 of which were successful.

Figure 35

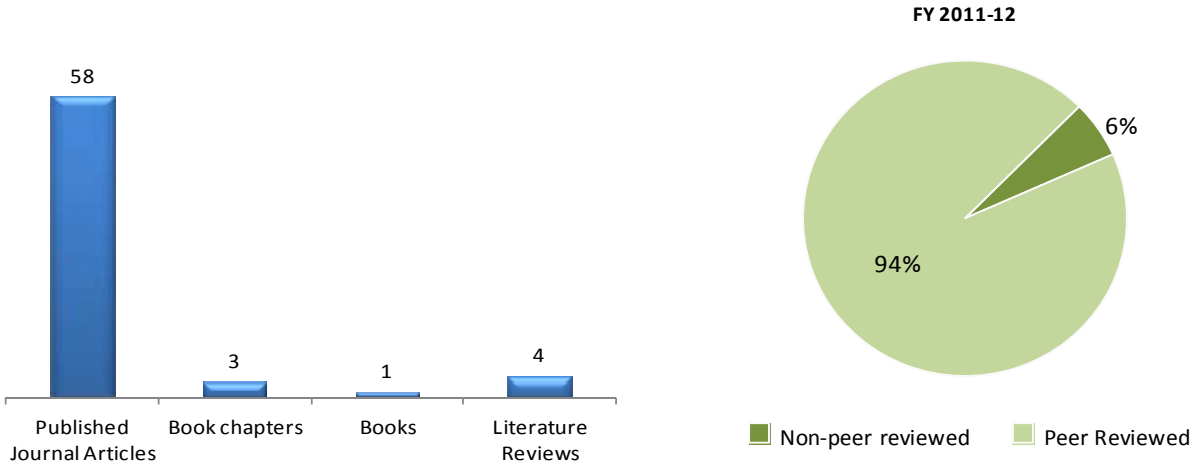
BCMHARI's CIHR Operating Grant Application Success Rate & Number of Applications Submitted/Approved



Total number of Publications by type and category (peer vs. non-peer reviewed) is collected for the first time this year. Peer review represents the gold standard for scientific credibility. See Figure 36 for a breakdown by type and category. The agency total represents the number for 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 one for each agency.

Figure 36

Total Number of BMHARI Publications by Type and Category

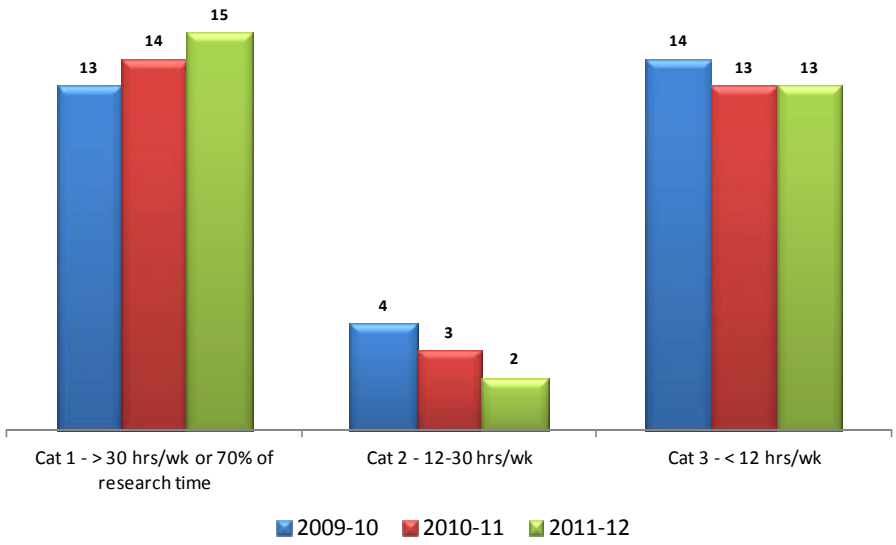


Building Research Capacity

BCMHARI continues to attract nationally and internationally recognized researchers to its research facility situated on the third floor of the Translational Research Building located on the Children's & Women's Health Centre of British Columbia (C&W) campus. BCMHARI is committed to integration of clinical and research activities that will lead to evidence-informed change of practice and system-wide improvements. In addition to the investigators, postdoctoral fellows, graduate students, research assistants, and technicians supporting the research enterprise at BCMHARI, many clinicians and front line staff also participate in research programs.

BCMHARI has a total of 30 researchers in FY 2011-12, with 15 having greater than 30 hours or 70% protected research time per week (Figure 37).

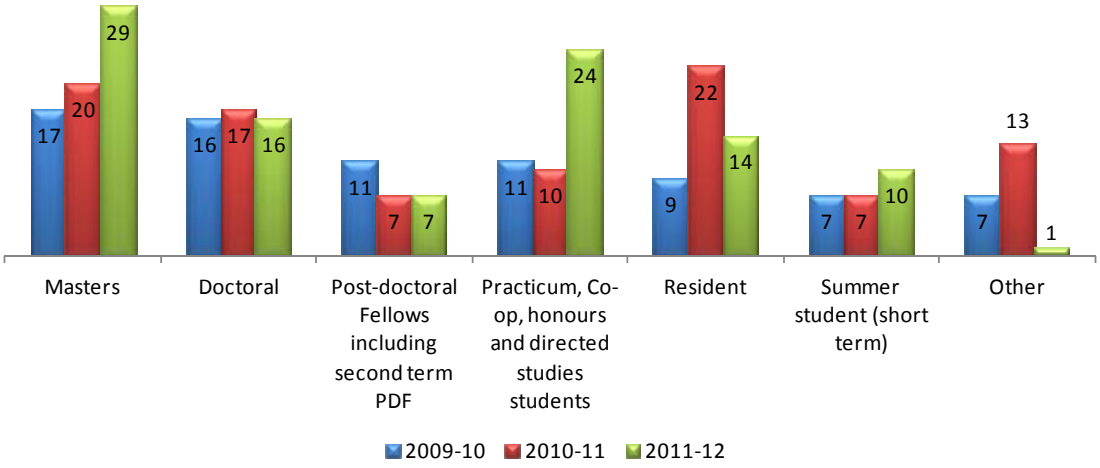
Figure 37
Total Number of BCMHARI Researchers by Category



During FY 2011-12, BCMHARI researchers provided training and supervision to a total of 101 trainees (up by 5 trainees from 2010-11). The largest increase was seen in the Masters category, from 20 in FY 2010-11 to 29 in FY 2011-12. Also of note is the large increase in Practicum, Co-op, honours and directed studies students.

Figure 38

Total Number of BCMHARI Trainees by Category



Advancing Health and Policy Benefits

There were two BCMHARI clinical trials active during FY 2011-12; over the course of the fiscal year, one of these clinical trials closed. Expected local subject enrolment (for the term of the four studies) was 195. As of March 31, 2012, total subject enrolment was 133, with 12 of these enrolments taking place between April 1, 2010 and March 31, 2011 (see Table 7).

Table 7
BCMHARI Clinical Trials

	09-10	10-11	11-12
Total Number of Clinical Trials active during the FY	4	4	2
Status of the Trial as of March 31 in the FY:			
Total Number of Active Trials	3	3	1
Total Number of Trials that closed during FY	1	1	1
Enrolment Numbers:			
Expected Local Subject Enrolment (for the term of the study)	403	395	195
Total Subject enrolment to March 31 in the FY	277	322	133
Total Subject enrolment during the period April 1 to March 31 during FY	82	67	12

Table 8 reflects a sample of key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2011-12 as a result of research driven by BCMHARI researchers, and their corresponding benefits. These outcomes represent important achievements in translational research that are improving patient outcomes and system sustainability.

Table 8

BCMHARI Outcomes Survey Responses

Please describe any guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 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.**
Development of the Canadian Alliance for Monitoring Effectiveness & Safety of Antipsychotics in Children (CAMESA) national guidelines for metabolic monitoring and screening when using second generation antipsychotics (SGAs). In addition to participating in the CAMESA guideline group, PHSA researchers conducted research which contributed to the development of these guidelines.	Chronic use of second generation antipsychotics (SGAs) has the potential to cause major metabolic and neurologic complications for patients. These evidence based guidelines outline recommendations for SGA safety. Appropriate monitoring procedures for adverse effects improve the quality of care for children treated with SGAs.
The development of a final report from the Canadian Agency for Drugs & Technologies in Health Research regarding optimal medication use. A PHSA researcher served as a specialist member on the CADTH committee and his research contributed to the final report: "Optimal use recommendations for atypical antipsychotics: Combination and high-dose treatment strategies in adolescents and adults with schizophrenia" CADTH, Optimal Use Report, Vol 1, Is. 1C.	This optimal use report is important in providing an evidence base for making decisions about prescribing antipsychotic drugs, and found no benefit for high dose or combination treatment strategies. These findings highlight opportunities for cost savings related to pharmaceutical use without compromising patient outcomes.
A double blind, placebo controlled study of the safety and tolerability of high dose quetiapine in patients with persistent symptoms of schizophrenia or schizoaffective disorder was reported in the Journal of Clinical Psychiatry and reported no benefit, but increased side effects for using the anitpsychotic quetiapine outside of the approved dose range.	The uptake of these report findings will improve the quality of patient care by reducing medication side effects. Cost savings may also be realized related to pharmaceutical use.
PHSA researchers reported "Excessive antipsychotic dosing in Canadian outpatient psychiatric population" in Psychiatric Services, a journal of the American Psychiatric Association. The publication documented the continuing problem with use of too high doses of antipsychotic drugs in the community.	The uptake of these report findings will improve the quality of patient care by reducing medication side effects. Cost savings may also be realized related to pharmaceutical use.
The creation of a clozapine titration guideline, freely available to physicians throughout the province of British Columbia. This is meant to compliment a pre existing guideline for initiating clozapine in the community, which was updated in July 2011.	Clozapine is the only drug with proven efficacy in treatment resistant psychotic conditions and is underutilized in BC. It is hoped that providing tools that facilitate clozapine use will improve outcomes in persons suffering from schizophrenia.
Accreditation Canada recognized the Short Term Assessment of Risk & Treatability (START) as a leading practice in June 2011. In March 2012, the START received an excellence in quality award from the BC Patient Safety & Quality Council in the category of "Living with Illness". The START was created to inform daily clinical decision-making via tool that was attentive to a patient's strengths as well as their risks & vulnerabilities. The START was co-authored by two PHSA researchers and has been translated into 8 languages and incorporated into clinical practice and large-scale research programs in 15 nations.	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). The "Living with Illness" award recognizes a team focused on improving care and support for chronic illness or injury.

Please describe any guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 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.
Implementation of an online tool and website (www.switchrx.ca) to guide healthcare professionals when switching a patient from one antipsychotic to another. Canadian healthcare professionals are invited to use the tool. A BCMHARI researcher is a lead author.	Switchrx provides clinicians with the most current and useful information to guide their clinical practice when switching their patients' antipsychotic treatment regimens. This knowledge translation initiative builds capacity among healthcare professionals across the country. The quality of patient care is improved by reducing potential adverse impacts when switching medications.

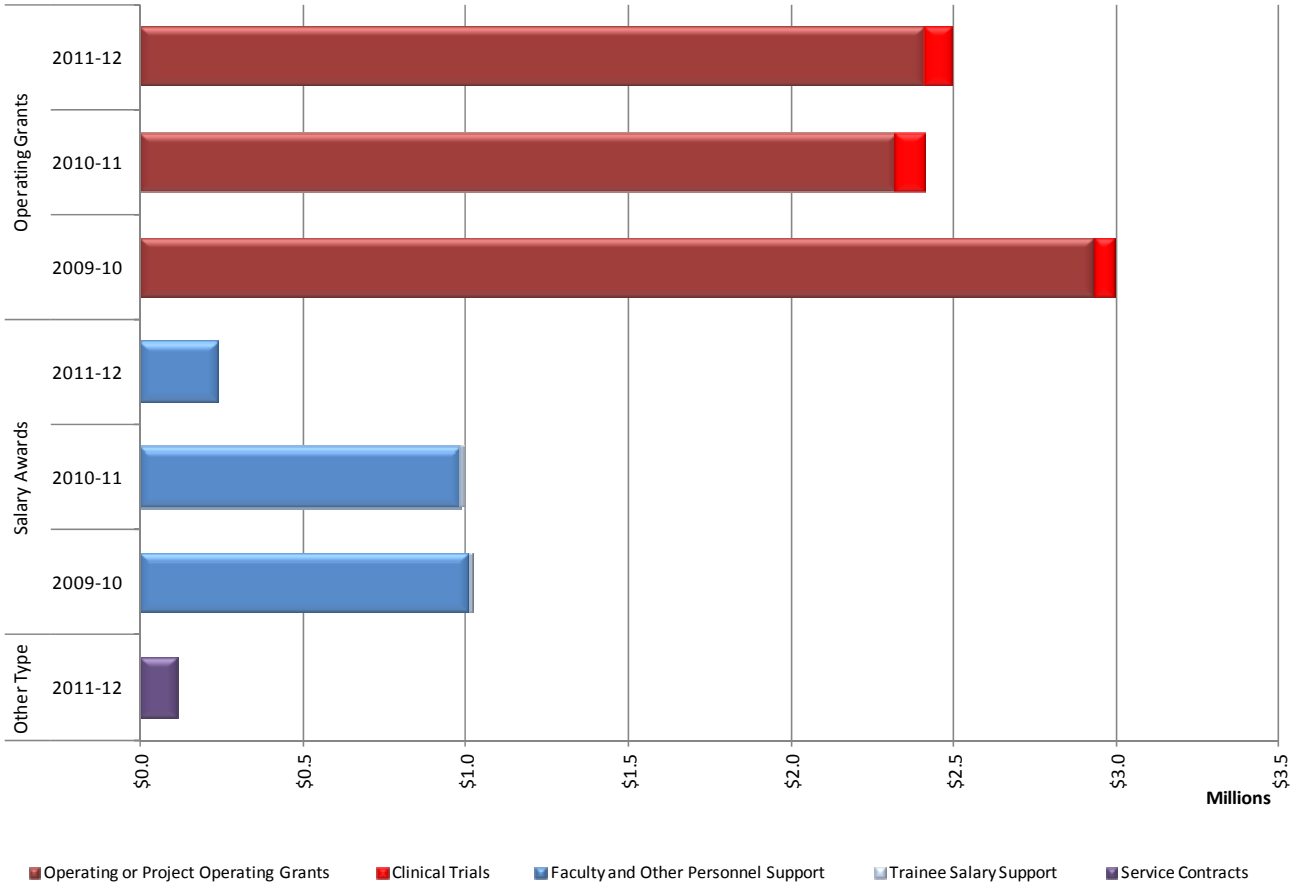
BC Centre for Disease Control/UBC Centre for Disease Control (BCCDC/UBC CDC)

Producing and Advancing Knowledge

In FY 2011-12, researchers affiliated with BCCDC/UBC CDC were awarded a total of $2,852,679 (down $560,065 from FY 2010-11) in research funding. The amount awarded as Operating Grants ($2,498,112) makes up 88% of total awards. A breakdown of funding types and subtypes can be found in Figure 39. 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

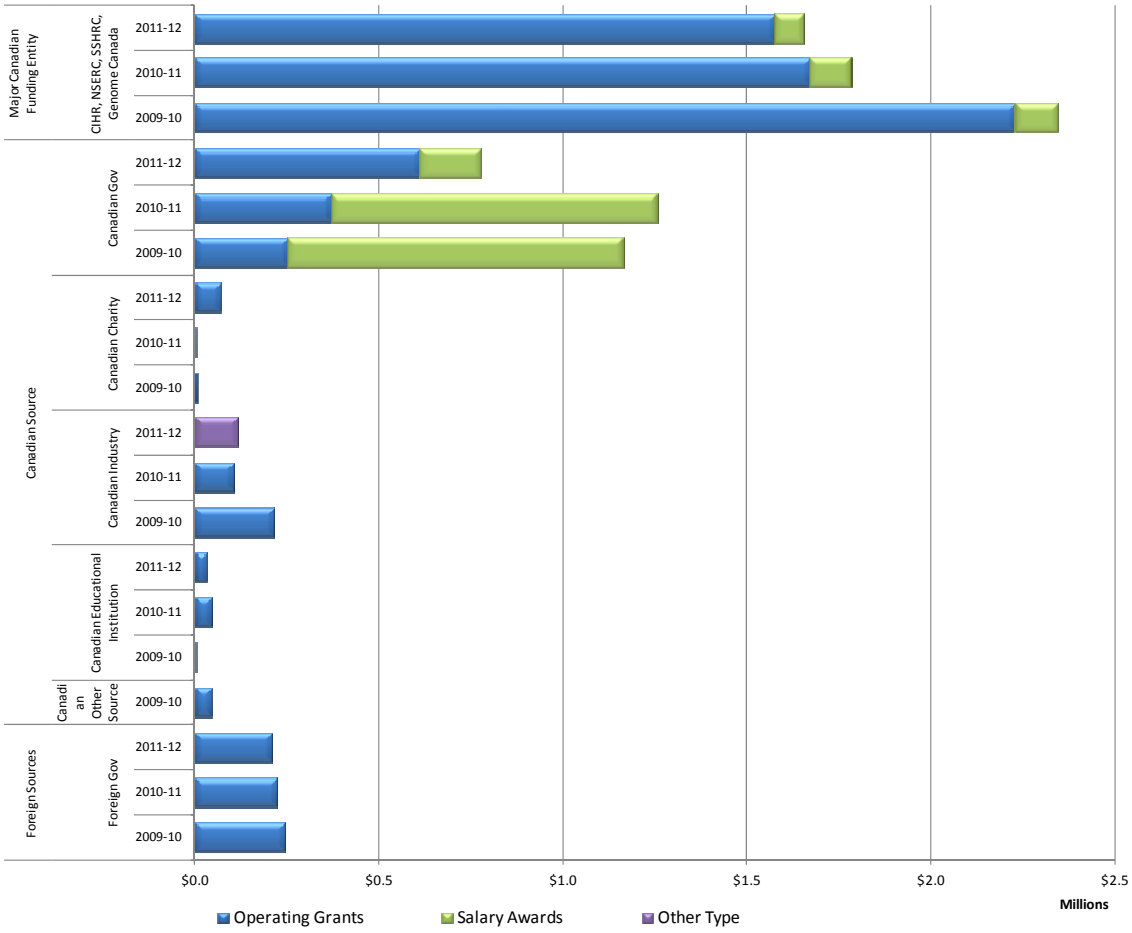
Total BCCDC/UBC CDC Research Funding by Funding Type and Sub-type



The top two funding categories are Major Canadian Funding Entity (58%) and Other Canadian Government (27%). Figure 40 details the major funding categories by funding type. A complete list of funding sources is detailed in Appendix 9.

Figure 40

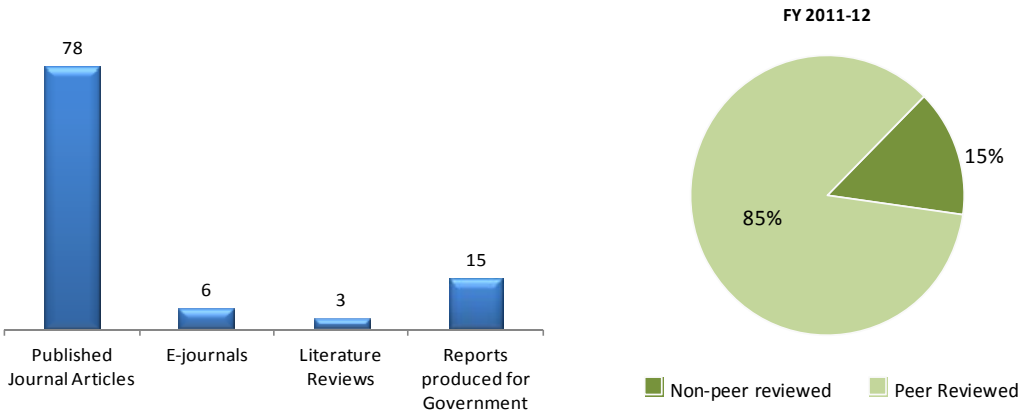
Total BCCDC/UBC CDC Research Funding by Funding Source and Type



Total number of publications by type and category (peer vs. non-peer reviewed) is collected for the first time this year. Peer review represents the gold standard for scientific credibility. See Figure 41 for a breakdown by type and category. The agency total represents the number for 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 one for each agency.

Figure 41

Total Number of BCCDC/UBC Publications by Type and Category

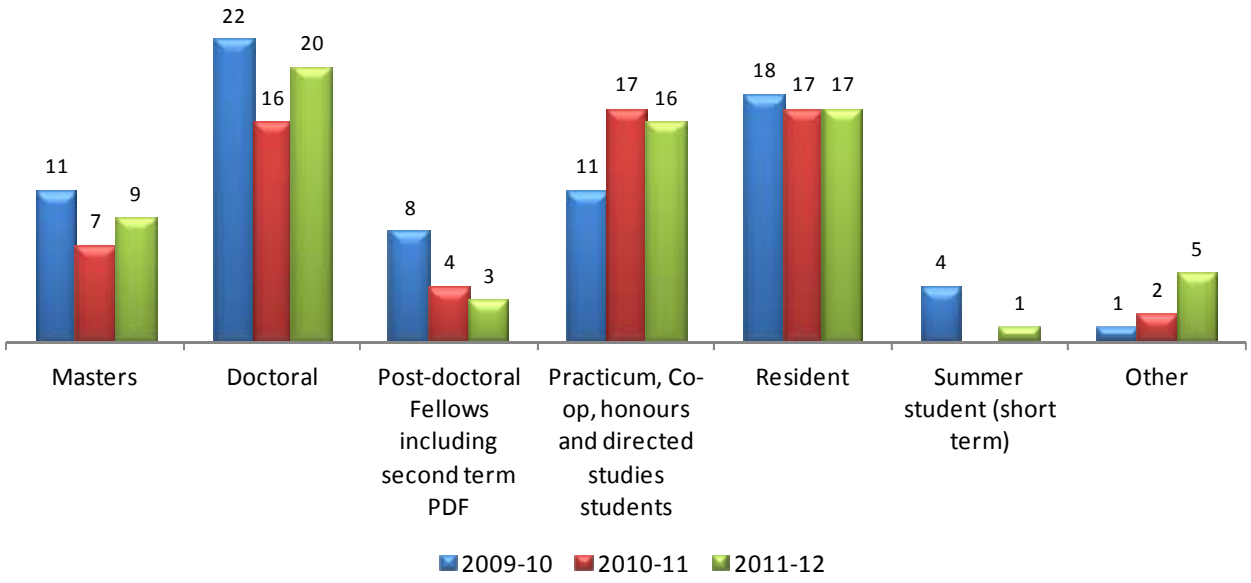


Building Research Capacity

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 32 researchers meeting this definition in FY 2011-12.

During FY 2011-12, BCCDC/UBC CDC researchers provided training and supervision to a total of 71 (up 8 from FY 2010-11) trainees (see Figure 42).

Figure 42
Total Number of BCCDC/UBC CDC Trainees by Type



Achieving Economic Benefits and Innovation

For the first year, BCCDC has data to report for metrics showing economic benefits and innovation. For FY 2011-12 BCCDC had three (3) Provisional Patent Applications (related to the Chlamydia vaccine), and three (3) National Patents filed.

Advancing Health and Policy Benefits

Table 9 reflects a sample of key guidelines, drugs, diagnostic agents or devices adopted or approved in FY 2011-12 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 9
BCCDC/UBC CDC Outcomes Survey Responses

Guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	**Benefits to patients, population health, and/or health system sustainability of the items identified**
Analysis of provincial laboratory gonorrhea culture sensitivity data demonstrated rising elevated minimum inhibitory concentrations to azithromycin and cephalosporins, drugs used for the treatment of gonorrhea.	Sharing of findings nationally directly informed the development of the Canadian STI Guideline treatment recommendations for gonorrhea, and has led to practice change in British Columbia.
Demonstration that targeted implementation of pooled nucleic amplification testing for HIV (which reduces test window period) at high prevalence clinics in Vancouver resulted in a 9% increase in diagnostic yield (the number of detections in a population).	Diagnoses of HIV that would otherwise have been missed, made during the acute period when viral load and potential for transmission is high. As a result of these findings, we are pursuing greater adoption of this technology in BC.
Retrospective analyses showed sharply increased mortality in the Lower Mainland when the 2-day average of maximum temperatures was greater than 31 degrees at Vancouver airport and/or greater than 36 degrees at Abbotsford airport. The average of observed and forecast temperatures could reliably predict such conditions before they occurred.	This work was used by Environment Canada, regional health authorities, and local municipalities to develop an extreme heat warning system and an algorithm for public health response to reduce excess mortality.
In support of the two vs. three dose Human Papillomavirus vaccine program we developed and implemented a pseudovirus-based HPV neutralization assay to measure the HPV serological response in vaccines.	We have been able to show that this assay is more sensitive than proprietary Merck assays. The pseudovirus-based HPV assay is more sensitive than the Merck Competitive Luminex Assay and more sensitive and specific than the Merck Total IgG assay. This assay enables BC to independently verify the serological response to HPV vaccination which guides better vaccine assessment decision making.
Development of guidelines for "Modern contact investigation methods for enhancing tuberculosis control in Aboriginal communities".	Contact investigation (CI) guidelines exist but these strategies do not take into account new approaches including social network analysis, geographic information systems and genomics, in addition to the widespread use of genotyping to better understand TB transmission. The successful integration of these novel methodologies will not only be the systematic collection, analysis, and interpretation of CI data in high-burden communities to assess transmission, but the prioritization of contacts who are candidates for treatment of LTBI. Ultimately, the measure of success will be a clear and sustained decline in TB incidence in Aboriginal communities.
Our findings demonstrated that food safety is important during pregnancy and there is a need for improvements in messaging and availability of resources for pregnant women in BC. Based on this work, new targeted resources were developed (www.bccdc.ca/foodsafetyinpregnancy).	These resources will provide consistent and accurate information on food safety and listeriosis for women and their health care providers which will hopefully improve knowledge and practices related to food safety and listeriosis, and prevent illness and serious outcomes in pregnant women and their children.
Parental immunization has been recommended as a "cocoon" strategy to prevent serious pertussis outcomes in early infancy. We assessed the number needed to vaccinate (NNV) for this program based on recent epidemiologic data from the provinces of Québec and British Columbia (BC), Canada. We found a very high NNV for parental immunization of at least 1 million to prevent 1 infant death,	The parental cocoon program was found to be highly inefficient and resource intensive for the prevention of serious pertussis outcomes in early infancy. Our findings underscore that other measures should be preferentially sought to protect against infant pertussis and that investment in cocooning is unlikely to mitigate infant risk but would be a significant drain on resources. These

Guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	Benefits to patients, population health, and/or health system sustainability of the items identified
approximately 100 000 for ICU admission, and >10 000 for hospitalization.	findings generated substantial media coverage and were incorporated by policy makers in British Columbia and other provinces in guiding pertussis control efforts.
Cases of a novel swine-origin influenza A(H3N2) variant (A(H3N2)v) have recently been identified in the United States, primarily among children. There is concern that this swine-origin virus, like the pandemic H1N1 virus, could also establish epidemic spread. To assess that risk, we estimated cross-reactive antibody to A(H3N2)v by age and assessed whether seasonal trivalent inactivated influenza vaccine (TIV) may improve sero-protection. We showed that few children but a greater proportion of adults have some protection against this novel emerging swine-origin virus. We found that antibody protection in adults decreased with increased age. Current TIV did not improve that antibody protection.	Our findings were the first to be published related to sero-protection against the novel swine-origin H3N2v influenza virus, currently emerging in North America. Our findings inform ongoing risk assessment and underscore the need for a specific vaccine, particularly for children and older adults, should this virus establish epidemic spread.
We assessed epidemiologic features and risk factors for pandemic H1N1 illness among Aboriginal and non-Aboriginal people during a community outbreak. We identified substantial clinical attack rates exceeding 20% with secondary household attack rates as high as 50% in young children. Having a chronic condition, younger age and prior receipt of seasonal influenza vaccine were risk factors. The serial interval was short at just 3.5 days. Aboriginal people on-reserve had higher chronic conditions, household density, influenza-like illness, medically-attended illness and secondary attack rates.	This is one of the only studies globally to assess and compare pandemic H1N1-related illness during the first epidemic wave in Aboriginal and non-Aboriginal people on- and off-reserve. We identified substantial illness rates and spread within households with short serial interval suggesting a narrow period to prevent transmission. These findings informed risk assessment real time during the pandemic and will also support subsequent pandemic preparedness activities.
The annually reformulated trivalent inactivated influenza vaccine (TIV) contains only one of two influenza B/lineages whereas both lineages contribute to winter illness. Vaccine protection against influenza B is highly variable and unreliable and is frequently suboptimal. We assessed prime boost response in young children following a change in the B/lineage included in TIV. We found that children primed with B/Yamagata lineage antigen subsequently experienced lower vaccine response to the changed B/Victoria lineage antigen.	Influenza B is a significant cause of annual winter respiratory illness, especially among young children. Our study helps to inform the reasons for variable and suboptimal TIV-induced influenza B protection, important to reduce its overall burden and impact. Findings were presented to Canada's National Advisory Committee on Immunization, informing the national influenza statement.
To validate and better understand paradoxical cross-lineage influenza B vaccine responses we previously observed in children, we conducted additional mouse experiments. The mouse studies confirmed the unexpected cross-lineage influenza B responses we originally observed in children and furthermore demonstrated that response to the B/Yamagata lineage was dominant regardless of the sequence of B/lineage vaccine administration. We also showed significant blunting of pandemic H1N1 vaccine responses in mice when preceded by seasonal H1N1 immunization – a finding also consistent with observations in human immunogenicity trials and epidemiologic studies.	Immunologic interactions between influenza viruses considered antigenically distant and in particular the cross-lineage influenza B and dominant Yamagata boost responses we have observed in both human and animal studies help inform the reasons for variable and suboptimal influenza B vaccine responses. These findings support the pursuit of improved influenza B vaccine options, including quadrivalent formulations inclusive of both influenza B lineages.

Guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	Benefits to patients, population health, and/or health system sustainability of the items identified
During the 2010-2011 winter a large number of outbreaks due to influenza A/H3N2 in long-term care facilities, including higher-than-expected attack rates among vaccinated staff, were reported in some regions of Canada. We used the BC-led national sentinel influenza surveillance system real time to assess the reasons for excess facility outbreaks. We identified a new genetic variant of H3N2 virus circulating across the sentinel network and measured suboptimal vaccine effectiveness against this variant to explain facility outbreaks.	Our findings highlight the utility of the BCCDC-led multi-component sentinel surveillance platform that incorporates genotypic, phenotypic, and epidemiologic indicators into the assessment of influenza virus, new variant circulation, vaccine relatedness, and vaccine effectiveness. This is currently the only system in Canada to routinely monitor influenza vaccine performance annually. Our findings mid-season were communicated real time to provincial health authorities and informed adjunct prevention and control measures to address suboptimal vaccine protection that season.
We used the BCCDC-led sentinel surveillance system to conduct detailed antigenic and genetic characterization of influenza viruses circulating across Canada and correlated this with estimates of influenza vaccine effectiveness showing cross-protection against major and minor influenza variants during the 2007-2008 season.	Despite antigenic variation, we measured substantial cross-protection from seasonal influenza vaccine during the 2007-2008 season indicating the benefits of immunization even during seasons of vaccine mismatch.
The elderly suffer the highest rates of hospitalization and death due to influenza. Administrative databases provide efficient methods to estimate influenza vaccine effectiveness (IVE) against severe outcomes in the elderly but are prone to intractable bias. Recent studies suggest earlier measures of influenza vaccine effectiveness in the elderly were over-estimated. This study returned to one of the linked population databases by which IVE against hospitalization and death in the elderly was first assessed. We explored IVE across six influenza seasons, including periods before, during, and after peak activity to identify potential markers for bias. The most pronounced estimates of influenza vaccine effectiveness in the elderly were paradoxically observed pre-season, indicating bias tending to over-estimate vaccine protection. Change in immunization habit from that of the prior two years was a marker for this bias in administrative data sets; however, no analytic technique explored could adjust for its influence. Improved methods to achieve valid interpretation of protection in the elderly are needed.	Our study points to improvements required in the monitoring and evaluation of vaccine protection in the elderly. Without these improvements we will not arrive at an accurate understanding of influenza vaccine effectiveness in the elderly. Such understanding is important in the development of improved vaccine options for influenza prevention in those at greatest risk of its severe complications.
We collected epidemiologic information using a standardized questionnaire from patients with laboratory-confirmed pandemic H1N1 illness to assess risk factors for hospitalization, ICU admission and death. We identified that age <5 years, comorbidity and delayed consultation were associated with hospitalization.	In preparation for the next pandemic, these risk factors suggest ways of targeting interventions to improve health outcomes and associated burden and costs.
Together with collaborators at Quebec's INSPQ, we investigated the largest outbreak of measles in North America in more than a decade occurring in Quebec in 2011. We evaluated reasons for sustained transmission, including effectiveness of the recommended Canadian schedule of two-dose measles immunization. We found that residual susceptibility to measles was 2-4-fold higher among 2-dose recipients who had received the first dose of measles vaccine before 15 months of age.	Our findings suggest that administration of the first dose of measles vaccine before 15 months of age may not be optimal for the measles elimination goal articulated by Canada and other countries. Our findings were thus presented to Immunization Advisory Committees in the United States and Canada, as well as the Pan American Health Organization to inform control measures related to measles elimination. Publication was accompanied by expert editorial.

Guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	Benefits to patients, population health, and/or health system sustainability of the items identified
In children aged 6 months to 9 years, a single pediatric dose of the AS03-adjuvanted pH1N1 vaccine was highly protective (85%) against hospitalization beginning at 10 and 14 days after vaccination.	Canada selected an AS03-adjuvanted formulation as dose-sparing vaccine against pandemic H1N1 illness. Our study shows this vaccine to have been highly effective, even as a single dose, in young children.
We found substantial persistence of antibody to the pandemic strain one year after a single paediatric dose of AS03-adjuvanted pandemic vaccine and a seroprotective level of antibody to this strain in virtually all children who received a single dose of the 2010-2011 TIV one year later. In contrast, two doses of the 2010-2011 TIV were necessary to induce an adequate immune response to seasonal strains in children previously naïve to seasonal vaccine.	Canada selected an AS03-adjuvanted formulation as dose-sparing vaccine against pandemic H1N1 illness. Our study shows this vaccine to have induced substantial and durable protection, readily boosted with a single dose of seasonal TIV one year later.
School surveillance has been used as an early indicator of influenza activity in the community but its utility has not previously been evaluated. We compared this surveillance approach with other available influenza indicators. We found that school surveillance was well-correlated and slightly anticipated compared to other population indicators.	This study informs the utility of school absenteeism as an early warning signal of imminent and generalized community spread of influenza.
Based on results from a transmission dynamic contact network mathematical model, it was shown that a variety of intervention strategies should be employed to efficiently contain an emerging epidemic with different degrees of contagiousness.	Results from this study were incorporated to update BC Ministry of Health pandemic preparedness plan.
A new methodology was developed to estimate the speed at which an emerging respiratory infection will propagate within a population – known as the basic reproduction number – at the early stage of an outbreak.	This framework will become available to all international public health agencies and research groups and will be used to estimate epidemiological parameters should an emerging epidemic strikes a population in the future.
Patients' waiting and service times were quantified using radio-frequency identification (RFID) wireless technology in the BCCDC TB clinic.	Analyzing collected data provided insight into areas for workflow improvement that resulted in a reduction of patient wait times.
Using radio-frequency identification (RFID) wireless technology, we were able to quantify duration and proximity of contacts among different types of health care workers in BCCDC TB clinic.	The collected data constitutes one of the first datasets to shed light on the contact patterns responsible for spreading respiratory pathogens in healthcare settings. The data provides valuable input to mathematical modeling frameworks to inform hospital infection control guidelines.
A mathematical model was developed to study the transmission dynamics of various strains of HPV among the BC population; this model relates various biological, clinical and epidemiological factors associated with HPV transmission to one another in a dynamic manner. This framework allows us to consider the impact of HPV vaccination on the incidence of many HPV related diseases in BC women and men.	Using the model predictions, we have evaluated the population-level performance of select vaccination strategies to help determine the optimal HPV vaccination program for BC.
A survey of hundreds of FOODSAFE graduates showed that food safety knowledge declined with years since original training, but that it improved dramatically after retraining.	Certificates from FOODSAFE did not previously have an expiry date. All FOODSAFE certificates will now expire after five years, ensuring that food service professionals in BC are up-to-date with best practices for food handling.

Guideline, drug, diagnostic agent or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	Benefits to patients, population health, and/or health system sustainability of the items identified
The BC Drug and Poison Information Centre (DPIC) observed a significant increase in the number of calls about severe reactions to the street drug ecstasy.	The staff at DPIC collaborated with the Harm Reduction group at the BCCDC, the PHSA Provincial Toxicology Centre, health authorities, drug users groups, police, and coroners to develop widely-publicized harm reduction strategies for those who choose to use ecstasy.
A survey of provincially-regulated facilities found that those producing ready-to-eat fish products were disproportionately contaminated with the potentially-harmful bacterium Listeria.	Members of the Canadian Food Inspection Agency, Health Canada, Ministry of Agriculture, Ministry of Health, and the health authorities formed a provincial working group to develop strategies for reducing Listeria risk. These included tools for assessing risk in the production line, and schedules for routine testing and inspection of facilities producing ready-to-eat fish products.

Women's Health Research Institute (WHRI)

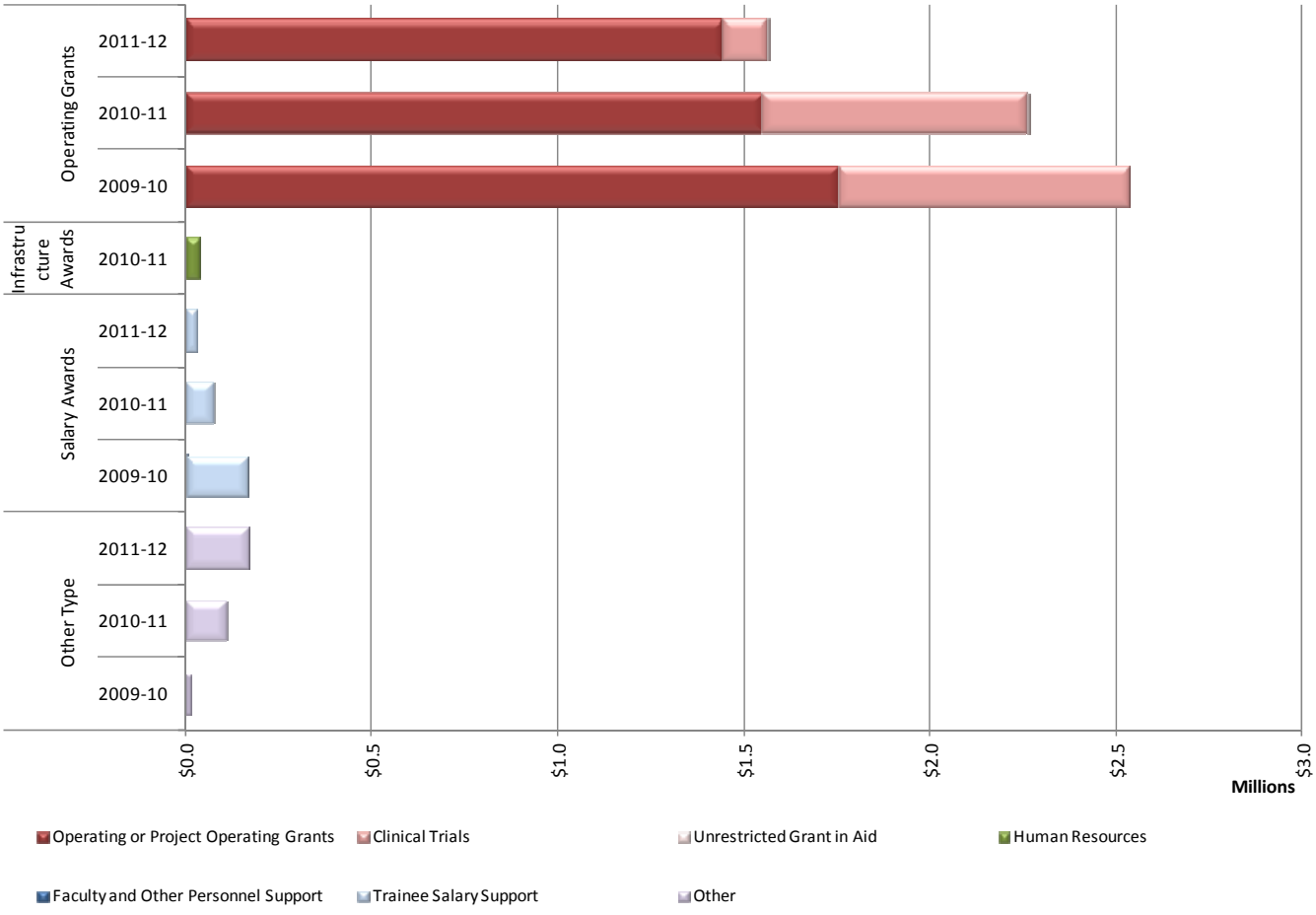
Producing and Advancing Knowledge

WHRI was created in 2005 by the BC Ministry of Health and the PHSA with a mandate to build and develop women's health research for the PHSA and for British Columbia. The WHRI is unique as the focus is on nimble response to clinically driven research questions. It provides broad-based support to member researchers.

In FY 2011-12, researchers affiliated with WHRI were awarded a total of $1,782,148 in research funding. The amount awarded as Operating Grants ($1,575,184) makes up 88% of total awards. A breakdown of funding types and subtypes can be found in Figure 43. 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 agreements is in place to allocate attribution of shared investigator grants. As a result, total research funding below is understated.

Figure 43

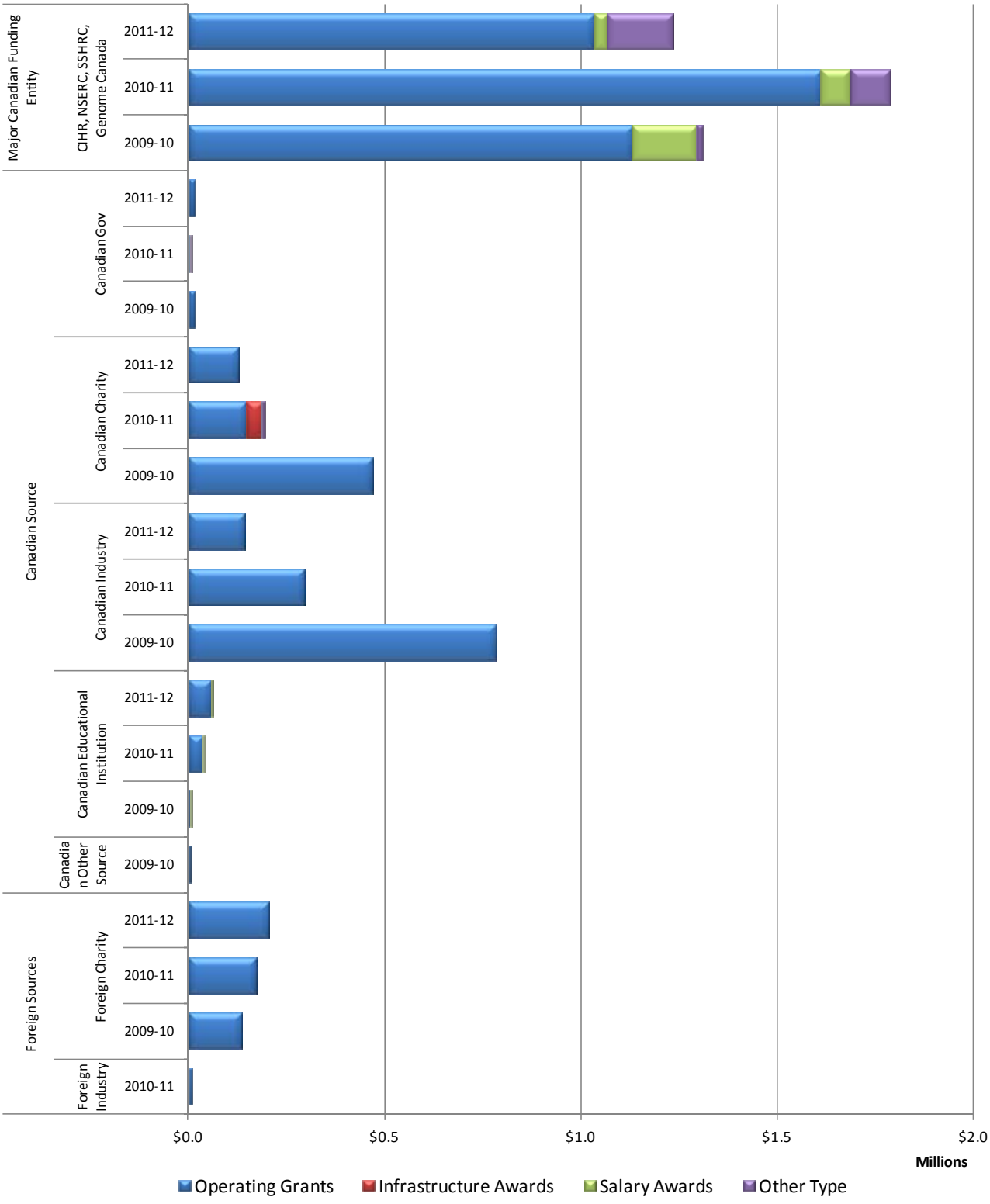
Total WHRI Research Funding by Funding Type and Sub-type



In FY 2011-12, the top two funding categories are Major Canadian Funding Entity (69%) and Foreign Charity (11%). Figure 44 details the major funding categories by funding type. A complete list of funding sources is detailed in Appendix 10.

Figure 44

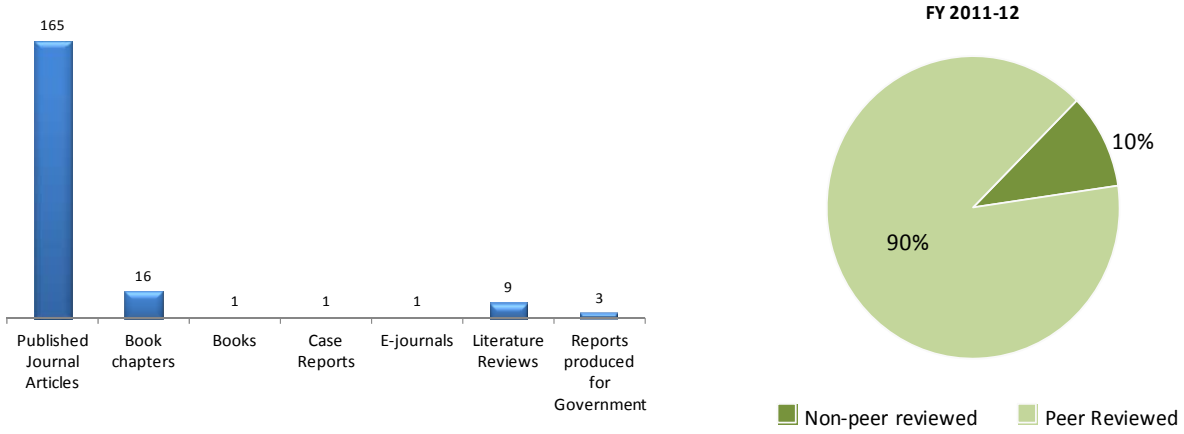
Total WHRI Research Funding by Funding Source and Type



WHRI had one application submitted in the September CIHR operating grant competition. This is not graphically represented due to small sample size. Members of the WHRI apply for grant competitions that are offered by a variety of granting agencies. While CIHR Operating Grant competitions provide a consistent measure across PHSA research entities for comparison, in FY 2011-12 WHRI submitted 25 applications to various funding bodies and received approval for 15, resulting in a 60% success rate.

Total number of Publications by type and category (peer vs. non-peer reviewed) is collected for the first time this year. Peer review represents the gold standard for scientific credibility. See Figure 45 for a breakdown by type and category. The agency total represents the number for 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 one for each agency.

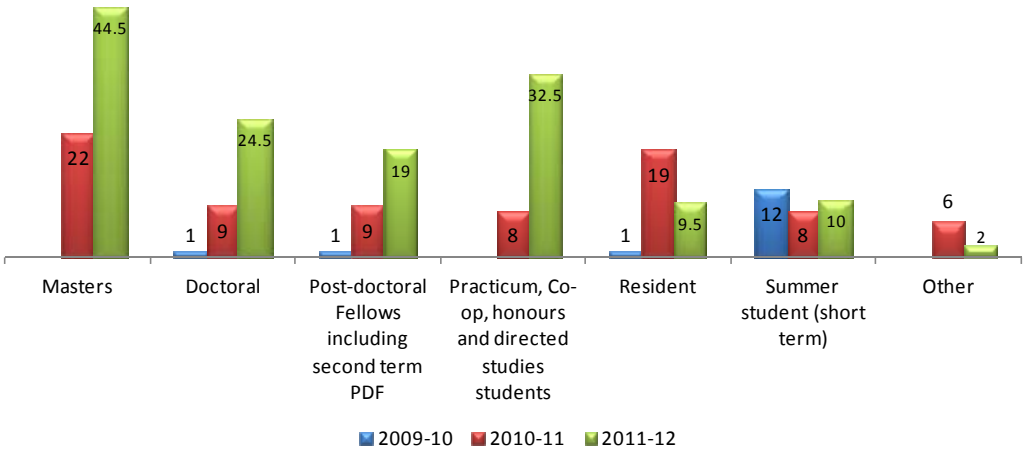
Figure 45
Total Number of WHRI Publications by Type and Category



Building Research Capacity

In FY 2011-12, WHRI researchers provided training and supervision to a total of 142 trainees (up 61 from FY 2010-11). This is in part due to better data collection and does not necessarily reflect an increase in the number of trainees (see Figure 46).

Figure 46
Total Number of WHRI Trainees by Type



In an effort to show WHRI's activities, their membership statistics are shown (see Figure 47). In FY 2011-12, the number of associate member investigators increased 72% (18) and the number of affiliate members more than doubled from 7 to 17. This can be attributed to the integration of WHRI into BC Women's Hospital, increasing interest of clinicians and

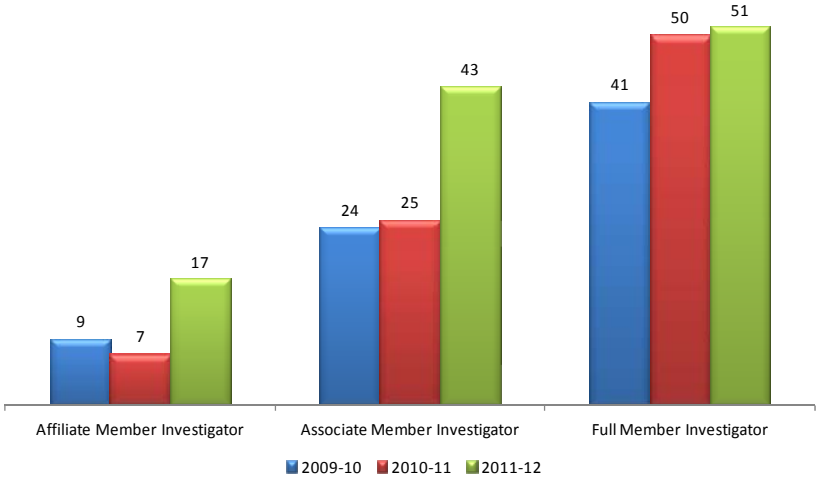
investigators on site with an interest in women's health research. The increase in Affiliate members can be attributed to investigators who are part of national and international teams led by WHRI that are now becoming members. The membership categories are as follows:

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 47
Total WHRI Membership by Category



Advancing Health and Policy Benefits

The challenge in reporting clinical trial information is that there is no central mechanism to capture information about active clinical trials on the C&W site. For the purposes of this report, data are based on RISe database files that answered "yes" to question 7.11 (a) (Registration for Publication of Clinical Trials) on an application form. Research Coordinators and Managers (PIs, when necessary) were then contacted to obtain enrolment numbers. The majority of clinical trials are likely included in this data (thanks to the network of coordinators/managers recently put in place) but it is possible that some trials have been missed (see Table 10).

Table 10
WHRI Clinical Trials

	09-10	10-11	11-12
Total Number of Clinical Trials active during FY	20	25	22
Status of the Trial as of March 31 in the FY:			
Total Number of Active Trials	15	18	20
Total Number of Trials that closed during FY	5	7	2
Enrolment Numbers:			
Expected Local Subject Enrolment (for the term of the study)	2,287	1,981	2,582
Total Subject enrolment to March 31 in FY	925	1,171	2,098
Total Subject enrolment during the period April 1 to March 31 in the FY	351	916	1,319

Table 11 reflects a sample of key guidelines, drugs, diagnostic agents, or devices adopted or approved in FY 2011-12 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 11
WHRI Outcomes

Guideline, drug, diagnostic agent, or device adopted or approved in FY 2011-12 as a result of research driven by PHSA researchers	Benefits to patients, population health, and/or health system sustainability of the items identified
Disseminated "Prevention of Vertical Transmission of HIV kits" province-wide, which were developed on the basis of research results	Improved patient outcomes and decreased costs to health care system due to prevention of HIV transmission.
Validation of innovative clinical practice – evaluation of the first year of the Early Pregnancy Assessment Clinic (EPAC)	Reduced wait times, patient anxiety, and lower risk with streamlining care.
Innovative Psychiatric Genetic Counseling service established in BCWH Medical Genetics as a result of research conducted by BCMHARI/WHRI researchers.	Improved outcomes for patients with increased access to expert health care and empowering patients with additional strategies to manage psychiatric illness.
National clinical guideline published: Substance Use in Pregnancy *WHRI/CFRI	Improved access to health care and assistance with appropriate addiction care is expected to reduce health care costs and decrease maternal and neonatal morbidity and mortality.
National clinical guideline published: Fetal and perinatal autopsy in prenatally diagnosed fetal abnormalities with normal karyotype.	Improved outcomes for patients with optimizing diagnostic testing through increased awareness and a thorough informed consent process.
National clinical guideline published: Prenatal screening for and diagnosis of aneuploidy in twin pregnancies.	Improved outcomes for patients with optimizing testing protocols and a thorough informed consent process.
National clinical guideline published: Ultrasound in Twin Pregnancies *WHRI/CFRI	Reduction in perinatal mortality and morbidity and short- and long-term neonatal morbidity in twin pregnancies through optimization of the use of ultrasound in twin pregnancies.
National clinical guideline published: Ultrasonographic Cervical Length Assessment in Predicting Preterm Birth in Singleton Pregnancies *WHRI/CFRI	Better patient outcomes and reduced costs to the health care system due to reduction in rates of prematurity and/or better identification of those at risk, as well as possible prevention of unnecessary interventions.
National clinical guideline published: Use of a DNA Method, QF-PCR, in the Prenatal Diagnosis of Fetal Aneuploidies	Reduced costs to the healthcare system and improved outcomes for patients due to optimization of testing protocol and a thorough process of informed consent.
National clinical guideline published: Prenatal Screening for Fetal Aneuploidy in Singleton Pregnancies	Improved patient outcomes, potential cost savings for the health care system.
National clinical guideline published: Management of Varicella Infection (Chickenpox) in Pregnancy *WHRI/CFRI	Improved maternal and fetal outcomes due to optimization of management of Varicella infections detected perinatally as well as prevention of Varicella infections in the perinatal period.
National clinical guideline published: Magnesium Sulphate for Fetal Neuroprotection *WHRI/CFRI	Improved patient outcomes and decreased costs to the health care system due to prevention of cerebral palsy and neonatal deaths.

Registries & Datasets

Advancing Health and Policy Benefits

Data stewards for a total of twelve PHSA registries or data sets, including two newly reporting registries, were invited to participate in a survey designed to assess registry/dataset purpose, access statistics, required resources, nature of research activities, and research benefits. 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 is 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 purpose

The Primary Purpose of each registry/dataset is listed below. For those registries that completed the survey last year, the primary purpose has not changed.

Registry/Dataset	Primary Purpose
BC Cancer Registry	Monitoring the Burden of Disease.
BC Cardiac Registry	Provides information for monitoring, planning and evaluation.
BC Perinatal Database Registry	The Registry is used to evaluate outcomes, care processes and resources through partnerships and collaboration in building a high quality system of care across the continuum. This ultimately leads to the optimizing of pregnancies and birth outcomes as a foundation for a healthy population.
BC Trauma Registry	To support the impact of the quality of care of the trauma patient.
Central Transfusion Registry	Blood/Patient Safety (Lookback, Traceback as per the Krever Commission) and Blood and Blood product utilization.
Cervical Cancer Screening Database	Clinical System for cervical cancer screening program patient as well as a lab system for all gynaecological cytology performed by the Provincial lab
PREDICT	Acts as a source of information for research involving BCCA patients.
PROMIS -Transplant	Monitors program effectiveness. Supports patient care.
PROMIS-BC Renal Agency	Clinical, administrative and research management of chronic kidney disease.
Screening Mammography Database	Clinical system for scheduling, reporting and tracking of screening mammography exams.
Surgical Patient Registry	Assists in the management of waitlists.
Tumour Tissue Repository	Acts as a source of information for research.

When asked to describe additional uses of the datasets, data stewards also consistently identified the following top two key purposes:

- a source of information for research
- for future planning and to plan program(s)

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 datasets above are categorized in Figure 48. Access requests are summarized in Figure 49. For examples of the types of research questions posed by researchers using the above data sets, please see Appendix 1.

Figure 48

Breakout of Predominant Nature of Research Questions Using Data from the Registries or Datasets

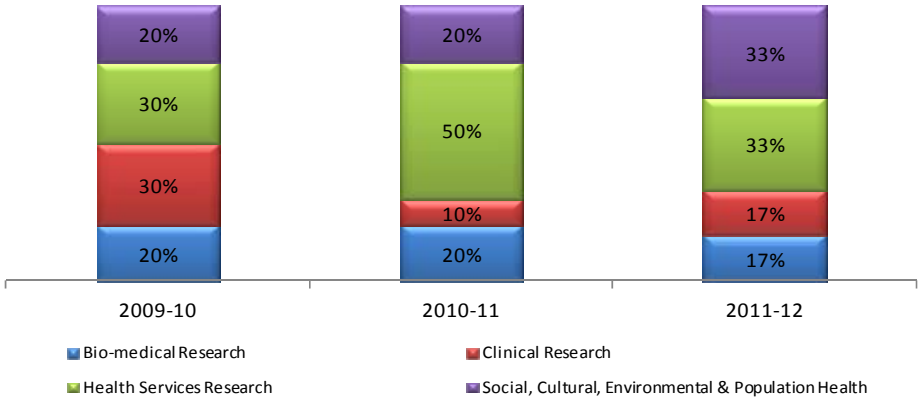
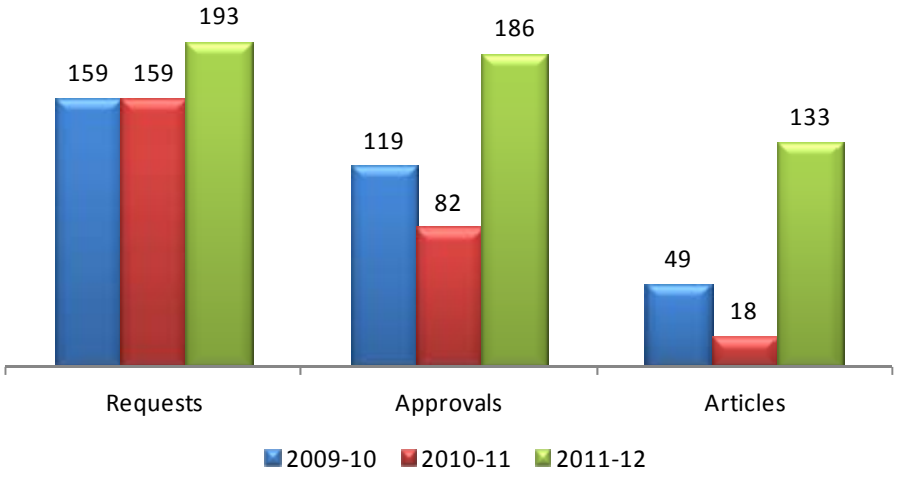


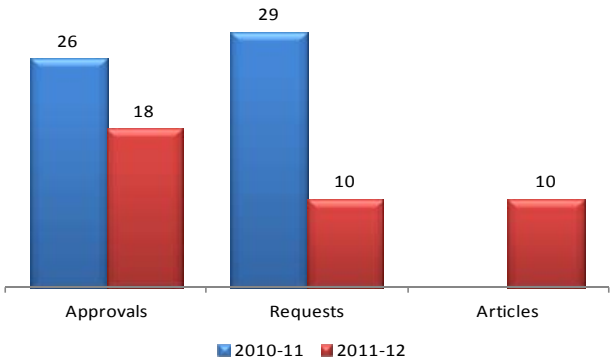
Figure 49

Research Requests and Approvals from Registry Research Resources by Fiscal Year



In addition to the below Registries, BC Ambulance Services, submits data to an International Registry, the Resuscitation Outcomes Consortium (ROC) which is a clinical trial network focusing on research in the area of pre-hospital cardiopulmonary arrest and severe traumatic injury. The result are 4 distinct data sets; Cardiac Clinical Trials, Trauma Clinical Trials, Cardiac Arrest Registry and Trauma Registry. See Figure 50 for FY 2011-12 access requests statistics for these data sets. BC Ambulance is mainly a health service delivery agency whose mandate includes the production of knowledge in the patient populations they serve.

Figure 50
Total number of ROC Research Requests/Approvals and Published Articles



Research Benefits

The total number of scholarly articles that were published during FY 2011-12 that resulted from, or reported on, access to data from PHSA registries or datasets was 133. The reliability of this data is in question as survey responses were often incomplete. A sample of patient and/or system benefits that were quantified, identified, or attained in FY 2011-12 that resulted from research based on the registry or dataset is excerpted below.

Tumour Tissue Repository	• The first basic and translational research data are now being generated from basic research studies that have accessed the TTR since fall 2008 and have led to scholarly publications. However it is too early in the life of a biobank (<6 yrs) to have supported clinical type research studies that included outcomes data and so to have a direct impact on patient care (as median outcome data on cases is <5yrs). However several patient and system benefits have occurred; 1. 1. The TTR has provided direct (>500 patients) and indirect (>1500 patients) opportunities to patients to contribute to and partner with our research programs through its support of the BCCA-VIC- PREDICT project 2. 2. The TTR has supported multiple successful grant applications from BCCA researchers to secure funding for research programs in addition to high profile/impact research publications including 4 Nature and Genome Research papers, one of which was cited by Time magazine as among the top 10 medical research discoveries for 2011 3. 3. The TTR has supported the creation of the first ever certification program for biobanks with online education and registration processes. This program was launched Nov 2011 at the national Canadian cancer conference and is provincial, national, and soon to be international in scope, and has been recognized internationally for its importance for improving quality in biobanking
BC Perinatal Database Registry (Perinatal Health Program)	• Surveillance and research data about rising trends in stillbirths, cesarean births and postpartum hemorrhage which in turn inform practitioners in terms of risk assessment, preventative strategies.
PREDICT	• PREDICT has engaged 1077 patients in research between April 1, 2011 and March 31, 2012. As a centre-wide program it is driven by all staff including a full time research intern dedicated to the project. It is important to note that the number of articles

	published that resulted from research based on PREDICT is unknown rather than zero.
Surgical Patient Registry	• HAs assessing their waitlists and updating data to ensure accurate publicly available waitlist information • Patient now have greater awareness of waits for surgery by individual surgeon.
BC Cancer Registry	• A study accepted for publication from a clinical group within BCCA using breast cancer patient data from the registry shows a benefit to radiation therapy in some cases with stage IV disease.
BC Trauma Registry	• Compliance with Trauma Performance Indicators
PROMIS-BC Renal Agency	• We described the association between the use of electron-beam sterilized hemodialysis membranes and the risk of thrombocytopenia. Based on this finding, we changed the use of the dialyzer types throughout the Province, renegotiated contracts with the vendor and evaluated the effectiveness of the solution

Appendix 1 - Example Research Questions by Registry/Dataset

Registry	Responses
Tumour Tissue Repository	• Are bacterial organisms associated with risk of colorectal cancer • What are the prognostic subtypes of triple negative breast cancer • What are the prognostic subtypes of ovarian cancer
BC Perinatal Database Registry (Perinatal Health Program)	• Fetal and infant mortality and serious neonatal morbidity among Status Indians in British Columbia • Determinants of severe maternal morbidity in British Columbia, Canada • Epidemiologic investigation of an increase in postpartum hemorrhage in BC • Rural Maternity Feasibility Index • Outcomes of intra-abdominal calcifications on prenatal ultrasound • The adequacy of prenatal care utilization in BC: A population-based analysis • Fetal, neonatal and maternal sequalae of birth weight and sex discordance among twin gestations • The early origins of infant and childhood health, behaviour and learning • Gestational diabetes project • Maternal socioeconomic status, health behaviors during pregnancy and adverse neonatal and infant health
BC Cancer Registry	• Does treating breast cancer patients with accelerated hypofractionation radiotherapy increase the risk of cardiac mortality (compared to conventional radiotherapy)? • What factors influence educational attainment in childhood cancer survivors and how does their educational attainment compare with the general population? • Is there significant regional variation in breast cancer prevalence in BC and how does health care resource utilization vary regionally? • What is the incidence of wood dust-related cancers in BC and what occupational groups are associated with an increased risk of these cancers? • Do rates of cancer surgery for common cancers vary regionally (national, provincial, census tract levels) and how do surgery wait times vary at these regional levels? • Are plasma levels of PCBs and pesticides associated with increased risk of malignant melanoma? • Are there significant ethnicity, gender, age and birth cohort effects contributing to incidence and mortality rates of head and neck tumors in BC. • Does a low-fat, high-carbohydrate diet reduce the risk of breast cancer in women with extensive mammographic density? • Do patterns of treatment, outcomes and lymphoma type differ across urban and rural BC places of residence? • Is obesity a significant predictor of outcome following treatment for colon cancer?
BC Cardiac Registry	• Whether the presence or duration of ST segment depression into recovery after exercise treadmill testing correlate with functional findings on myocardial perfusion scanning and anatomical findings on coronary angiograms to assess CAD burden and severity • Is there a difference in outcomes in STEMI patients treated with PCI compared to lytic that depends on infarct location • Transfusion requirements during and after cardiac surgery in British Columbia • Describe the clinical characteristics, management, and clinical outcome of consecutive angiographically confirmed stent thrombosis cases prospectively identified in British Columbia
Screening Mammography Database	• Request for clients to join the BC Generations Project • Request for client information to study and reduce CMM
Cervical Cancer Screening Database	• What is the risk of developing cervical cancer for women after age 69 when they have a history of cervical abnormality more than 20 years ago? • How do cervical cancer screening performance compare with other provincial program in Canada? • What is the screening rate for childhood cancer survivors?
PREDICT -	• Can a survivorship care plan for people with colorectal cancer positively affect QoL after treatment?
Surgical Patient Registry	• Why are there variations in wait time amongst surgeons? • Why are long waiters not receiving surgery sooner?
PROMIS – Transplant	• Steroid-free transplantation study • Evaluation of renal function for extra-renal transplants • ICU Retrospective Study of Liver Tx Project • Hep C patients transplanted in BC • Outcomes of Liver living donor transplantation • Comparison of transplant outcomes between NDD donors and DCD donors • Age matching allocation processes for renal transplantation • Effect of cold ischemic time in renal transplantation

Registry	Responses
	• Probability of infection in Heart transplant patients after treatment for rejection • Validation Macluskey's Clinical Risk index for predicting massive transfusion in Liver transplantation
PROMIS – BC Renal Agency	• Use of electron-beam sterilized hemodialysis membranes and risk of thrombocytopenia. • Early detection of CKD; benefits, limitations, prognosis. • Utility and cost of a renal transplant transition clinic • Impact of dialysis modality on survival after kidney transplant failure • Evaluation of Anemia Management by Algorithms in patients with Chronic Kidney Disease who are not receiving dialysis.
BC Trauma Registry	• Impact of the implementation of New Impaired Driving laws on the Trauma Patient • Operative vs. Non operative management of the Flail chest patient • Compliance with Trauma Performance Indicators • Chest Wall Trauma Study (Outcomes of Flail and Multiple Rib Fractures Patients) • Follow-up status of patients transferred out Pre and Post Trauma Program Implementation • The accuracy of TBSA estimation and Fluid resuscitation calculations for the burn patient prior to transfer to a Burn centre- a 10 year Retrospective Study • ARO in Canadian Burn units • Ethnicity and etiology of Burn patients
BC Transfusion Registry	• Blood use in PCI (Cardiac) • Blood use in Cardiac Surgery • Blood use in Pediatric Trauma Patients • The effectiveness of implementing new product technology

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 including ARIF (average relative impact factor)
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.

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
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Chief Administrative Officer - Research, PHSA

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Senior Research Manager, Women's Health Research Institute (WHRI)

Andrew Kmetic
Provincial Director, Data Services, Evaluation & Research, PHSA Cardiac Registry

Karin Jackson
Acting Director, Research Administration & Performance Improvement
BC Mental Health & Addictions Services

Aga Jendo. CMA
Director, Office of Research Facilitation, BC Cancer Agency

Karen Hagan
Grant Advisor, Office of Research Facilitation, BC Cancer Agency

Allison Rintoul
Director, Research & Education 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, 2012

Glossary

Term	Description
Metric Definitions	
***Metrics 1ab, 2b –** Total annual grant awards, Total annual external grant awards by major funding categories and Scholarships/fellowships all by agency or research entity	Total Annual Award ($) for Grants, Awards and Contracts by Funding Source
***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, BCMHARI and WHRI.
***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 mongraphs. Excluded = abstracts, editorials, summaries, letters to the Editor, epubs, in press and submitted publications.
***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.
***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.
***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.
***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.
***Metric 3b** – Licenses, royalty income and # spin-off companies	Total number of active license/assignment agreements and spin-off companies. List the names of all active spin-off companies. These numbers

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Term	Description
(Revised FY 10/11) * Metric 3b - continued	represent cumulative totals from year to year and are no longer reported by region. IP related revenue shall follow the UILO definitions from FY 2010-11 forward. **Definitions:** **Gross licensing revenue** = Royalties + Equity Liquidated + Option Fees + License Fees + License Management + Technology Assignment; **Net Licensing revenue** = (above – expenses for patenting, legal & related costs) * distribution % per distribution arrangement The net 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 includes 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.
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 11/12 for supported faculty salary awards including chairs.
Trainee salary support	Dollar amount for FY 11/12 for supported trainee salary awards including trainee research allowances.
Infrastructure Awards	
Human Resources	Dollar amount for FY 11/12 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 11/12 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).

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Term	Description
Capital, Equipment, Construction - Major CFI (Added in FY 10-11)	Dollar amount for FY 11/12 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 11/12 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 11/12 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 Lab Trials (4a) (Definition clarified in FY 10-11)	Dollar amount for FY 11/12 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).
Unrestricted /Grant in Aid	Dollar amount for FY 11/12 for Unrestricted or 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)

Glossary

Term	Description
Other Funding Type – Service Contracts Added as sub-type of Other Funding Type category in FY2010-11	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 FY2010-11	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 11-12, 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)	
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.
CIHR and its institutes	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	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	Natural Sciences and Engineering Research Council
SSHRC	Social Sciences and Humanities Research Council
Genome Canada and provincial Genome agencies	Genome Canada, and its regional centres: Genome BC, Genome Alberta, Ontario Genomics Institute, Genome Quebec, Genome Prairie, and Genome

Glossary

Term	Description
	Atlantic
MSFHR	Michael Smith Foundation for Health Research (BC)
Canadian Industry	Canadian-based for-profit corporations
Canadian Charity	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, 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 headquartered outside Canada
Foreign Charity	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 Masters program who are supervised by a faculty member affiliated with the reporting organization.
Doctoral (changed from PhD in FY 10-11)	Graduate students enrolled in a full time PhD program who are supervised by a faculty member affiliated with the reporting organization.
Post-doctoral Fellows including second term PDF	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)
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

Glossary

Term	Description
	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).
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