

FISCAL YEAR 2020–21

PHSA RESEARCH AND STUDENT EDUCATION

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PHSA Research and Academic Development Committee

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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) and the Framework for PHSA Student Education Metrics (see Appendix 3). As an academic health sciences organization, PHSA works in close partnership with the University of British Columbia, BC Institute of Technology, Simon Fraser University, University of Victoria, University of Northern BC, and other BC educational institutions. BC Emergency Health Services works closely with the Justice Institute of BC.

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

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PHSA'S MEASURABLE COMMITMENT TO RESEARCH & EDUCATION

Introduction to PHSA's 4th Consolidated Summary Report

PHSA Research & Academic Development is pleased to present its fourth annual consolidated summary of PHSA research and student education metrics. This year's report provides integrated information relating to PHSA's academic health science mandate for research and student education, including the profound impact of COVID-19. This year's report includes:

- dashboards that reflect, at a glance, quantitative metrics based on PHSA Board-approved performance indicator frameworks;
- narrative that highlights PHSA's academic health science mandate, how that mandate has been impacted by COVID-19, and the impacts and outcomes being realized in research and student education;
- PHSA program sections that identify the Top 3 research accomplishments by research entity (important achievements that may not be well reflected through quantitative metrics), present research and student education infographics (illustrating high level inputs and outputs), and detail research outcomes identified by PHSA research entities;
- examples of important research questions that are being answered through the rich data assets available in PHSA registries, and
- information on COVID-19 federal relief funding and COVID-19 research projects awarded to PHSA entities.

PHSA is expected to conduct world-class research, and to deliver excellence in education and training.

This consolidated and integrated reporting approach communicates how research is driving patient and health system benefits, and how student education is preparing a high performance health workforce for the future. While research, inquiry and learning take place across PHSA, this report relates activities associated with PHSA's five programs that have research institutes and that play a vital role in providing students with clinical practice education: BC Children's (BC Children's Research Institute), BC Women's (Women's Health Research Institute), BC Cancer (BC Cancer Research Institute), BC Mental Health & Substance Use Services (BC Mental Health & Substance Use Research Institute), and BC Centre for Disease Control (UBC Centre for Disease Control). This report also relates the essential training role of BC Emergency Health Services and the critical research role it plays in collaboration with non-PHSA researchers.

Detailed data for the PHSA Board-approved frameworks for research and student education metrics continue to be reported in the related supplementary reports that support operational decision-making and are available on the PHSA website: <http://www.phsa.ca/our-research/research-focus/research-education-metrics>

PHSA is one of Canada's largest academic health science organizations – organizations with an integrated mandate to deliver care, conduct research and train students. PHSA's provincial mandate strongly reinforces that role, specifying PHSA is "expected to conduct world-class research, and deliver excellence in education and training ... to support and underpin its ability to develop evidence-informed clinical policy and to deliver high quality provincial clinical services."

The following report illustrates PHSA's commitment to this critical role and the benefits that derive to patients, populations, and the BC health system.

PHSA RESEARCH METRICS

FISCAL YEAR SUMMARY - PHSA OVERALL

Indicator		Key Measure Description	FY 2018-19	FY 2019-20	FY 2020-21
			Value	Value	Value
Producing & Advancing Knowledge	1a	Total Annual Grant Awards by Type (including Major CFI Infrastructure grants) Salary Awards Infrastructure Awards Operating Grants Other COVID-19 Research Funding (included in above categories)	\$134,292,906 13,121,094 6,260,726 112,180,392 2,730,693	\$145,597,847 13,788,858 7,011,184 119,979,796 4,818,009	139,869,312 14,651,948 4,717,341 117,160,310 3,335,713 \$9,538,864
	1b	Total Annual Grant Awards by RISE Sector (including Major CFI infrastructure grants) Government Non-Profit Industry	65,855,459 50,949,809 17,487,637	66,778,795 60,676,760 18,142,292	76,330,526 47,325,166 16,209,620
	1c	CIHR Annual Grant Application Success Rate - PHSA Overall/ Nat'l ** Foundation Grant (Open) Fall Project Grant Sprint Project Grants	0%/13% 17.7%/14.9% 20.3%/15.6%	N/A 25.3%/15.7% 19.7%/16.9%	N/A 22.4%/19.0% 22.0%/20.3%
	1d	Total # Publications with Program Author BCCHR BCCRI WHRI BCCDC BCMHSUS	858 655 670 305 61	1,060 744 752 161 127	1,117 776 950 243 133
Building Research Capacity	2a	Total # Research Trainees	2,315	2,601	2,663
	2c	Total # Researchers (excluding Category 3 – Affiliate Investigator)	785	827.5	952
	2e	Research Support Fund Grants (Tri-Council only)	\$4,049,673	\$4,063,179	\$4,102,759
	NA	Canada Research Continuity Emergency Fund (CRCEF)	NA	NA	\$8,658,231
Achieving Economic Benefits & Innovation	3a	# Invention Disclosures	48	32	40
		# Provisional Patent Applications Filed	24	24	18
		# PCT Applications Filed	6	9	7
		# Patents Filed/Issued	12/17	11/21	20/21
	3b	# Active License Agreements	116	123	125
		# Spin-off Companies	14	17	18
IP Related Revenue – Realized Revenue BCCRI BCCHR		\$445,861 \$66,713	\$432,697 \$93,000	\$1,117,445 \$665,041	
Advancing Health & Policy Benefits	4a	Clinical Trials (including Non-PHSA PIs utilizing PHSA facilities and resources) # Active Trials at the End of the FY Cumulative Subject Enrollment at End of FY	619 47,600	656 21,400	657 20,591
		4b,c,d	Registries as Research Resources # Research Requests/Approvals	240/227	236/226

PHSA STUDENT EDUCATION METRICS

FISCAL YEAR SUMMARY - PHSA OVERALL

Indicator	Key Measure Description	FY 2018-19	FY 2019-20	FY 2020-21	
		Value	Value	Value	
Build Student Education Capacity	1a	Total Number of Student Hours by Program (excludes medical students)	272,052	263,099	234,495
		BCCH	103,766	96,351	99,084
		BCEHS	59,103	58,586	34,503
		BCW	38,418	40,905	29,915
		BCMHSUS (Forensics, MH & Addictions, Burnaby CMHA, CHS)	31,436	28,193	32,894
		BC Cancer - All Locations	26,241	28,229	24,965
		Sunny Hill	7,213	5,845	7,097
		All Other (BCCDC, PSBC, PHSA)	5,875	4,991	6,038
	1a	Total Number of Student by Program (excludes medical students)	1,723	1,714	1,465
		BCCH	643	637	582
	BCEHS	402	351	244	
	BCW	319	367	251	
	BCMHSUS (Forensics, MH & Addictions, Burnaby CMHA, CHS)	207	175	202	
	BC Cancer - All Locations	95	106	104	
	Sunny Hill	38	58	62	
	All Other (BCCDC, PSBC, PHSA)	19	20	20	
1b	Total Number of Medical Students by Program				
	Undergraduate Medical Students (annual)	493	463	451	
	Post-Graduate Medical Students (annual)	805	851	866	
1e	Estimated Cost of Staff Time by Encounter Type**				
	One-to-one	\$4,929,262	\$4,451,977	\$3,389,777	
	Group	\$110,652	\$164,119	\$169,070	
1g	Total # PHSA Declined Placement Requests in HSPnet**	145	208	384	
1h	Total # Staff Participating in Preceptor/Educator Training				
	Educator Pathway (Preceptor/Educator Training)	167	235	265	
	BC Emergency Health Services (Preceptor Training)	190	55	98	
1i	Total # Preceptors in HSPnet With and Without a Placement				
	With a Placement	333	369	348	
	Without a Placement	496	237	325	
Build Effective Partnerships and Collaborations to Support Innovation	2a	Total # Affiliation Agreements (% based on standard template)	68	76	76
	2b	Top 5 Education Institutions by Placement Hours-All Disciplines**			
		BCIT	64,813	67,329	57,646
	University of BC	45,251	45,519	39,573	
	Justice Institute of BC	53,980	52,705	29,558	
	Thompson Rivers University	19,175	11,014	20,062	
	Kwantlen Polytechnic University	15,060	12,503	16,895	
2c	Distribution of Student Hours by Student Education setting**				
	Hospital	148,589	136,879	131,485	
	On Car (Paramedic)	59,103	58,586	34,503	
	Outpatient/Mixed	52,779	56,360	54,479	
	Other (Population Health, Corporate, Community)	11,584	11,434	14,028	
Results	3a	# Hires at PHSA with Previous Placement	504 (20%)	482(18%)	195 (11%)

**Excludes undergraduate and post-graduate medical students and paramedics

COVID-19 PANDEMIC

PHSA PLAYS KEY ROLE IN LEADING PROVINCIAL RESPONSE

Emergence of the COVID-19 pandemic had a profound impact on PHSA's research and student education mandates in fiscal year 2020/21.

In March 2020, PHSA's research activities were dramatically curtailed with the exception of COVID-19 research, and projects and trials formally exempted by PHSA research institute leaders. All administrative staff and the majority of research staff initially were required to work from home, which significantly impacted conduct of research requiring lab and technical platform support. In collaboration with the University of British Columbia (UBC), on-site research activities, including clinical research, clinical trials, wet and dry labs, and core platforms, gradually resumed over the course of the year with strict adherence to required public health, WorkSafeBC, and PHSA and UBC guidelines and policies. Many researchers pivoted, revising research projects to address COVID-19.

While COVID-19 had a profound impact on curtailing planned research activities, it also acted as a catalyst for unprecedented collaboration within the research community, and spurred the launch of new research calls focused on generating evidence to inform the public health response. PHSA worked with multiple provincial partners, including UBC, the BC government, funders, and other health authorities and universities, to chart new paths for supporting clinical research and data access. PHSA research entities had significant success in COVID-19 funding calls, generating more than \$9.5M in new COVID research funding over the course of the year (see Appendix 5 for details). The BC Centre for Disease Control, in collaboration with PHSA's Data Analytics Research and Evaluation team, played a central role in conducting research and analytics utilizing real time data to inform the provincial pandemic response.

Of note, several PHSA research institutes identified COVID-19 achievements amongst their Top 3 achievements for the year, including:

- development of a saline gargle COVID-19 test as an alternative to nasopharyngeal swabs;
- development of a COVID-19 test within 10 days of genomic information being released—before BC had a single case;
- genomic fingerprinting of positive test samples which proved invaluable in identifying variants of concern and guiding the public health response;
- provision of information on infection control methods (hand washing, masking) and leadership in securing and distributing COVID vaccines;
- development of trustworthy and culturally meaningful public health guidance to address COVID-19 in Indigenous communities;
- leadership of a Canadian Surveillance Project of COVID-19 in Pregnancy to inform national recommendations for pregnant women and their infants; and
- launch of the COVID-19 RESPPONSE (Rapid Evidence Study of a Provincial Population Based Cohort for Gender and Sex) study to determine the impact of COVID-19 and associated public health measures on British Columbians, grounded in a sex- and gender-based analysis.

Cumulatively, these efforts highlighted in an unprecedented way the value of health research and society's dependence upon that research to enable health system response to and management of a global pandemic.

PHSA played a central role in conducting research and analytics utilizing real time data to inform the provincial pandemic response.

PHSA's research enterprise benefited significantly from federal relief funding, receiving more than \$8 million dollars in total from the Canada Research Continuity Emergency Fund (CRCEF).

A provincial website for student education was developed and hosted by PHSA to provide a single source of information for multiple stakeholder groups.

Because of the curtailment of research activities, COVID-19 also had a significant economic impact on PHSA's research institutes. PHSA research entities identified \$9,887,290 in actual and projected negative economic impacts, net of federal relief, including cuts to grant funding, loss of research revenues associated with events that were cancelled, and reductions in revenue related to clinical trials, animal care units and technological platforms. PHSA's research enterprise benefitted significantly from federal relief funding, receiving \$8,658,231 in total from the Canada Research Continuity Emergency Fund (CRCEF). COVID-19 impacts on PHSA research culture, experienced by trainees and early career investigators in particular, as well as impacts on equity, diversity and inclusion, were significant and there are efforts underway by research institutes to develop new supports and tools to address them.

As with research, COVID-19 had a profound impact on student education and the entry of final year students into the workforce. In March 2020, more than 400 student placements across PHSA facilities were paused. Early collaborative responses to the pandemic included the following actions to resume placements and support transition to practice:

- prioritizing the learning objectives to focus on ones that can only be met in clinical environments;
- adopting new measures to ensure safe learning environments, including environmental and administrative controls such as scheduling, adequate space, and personal protective equipment;
- adjusting the delivery, sequencing, and learning modalities of program curricula, including the use of simulation and virtual learning and care;
- assessing, prioritizing, and re-designing clinical placement experiences to ensure safety of patients, staff and students as well as optimize capacity for students on-site;
- evaluating students by competencies regardless of time spent in clinical placements;
- adjusting the processes, timing and interim strategies for professions with national exams;
- modifying the temporary licensing processes in some regulatory colleges, and;
- post-poning program start dates for some cohorts of learners.

Recognizing the importance of maintaining student learning in order to meet health workforce needs both during and post pandemic, PHSA played a key leadership role in coordinating a provincial response. Provincial student education data from Health Sciences Placement Network (HSPnet), the web-based student education placement system owned by PHSA and used across Canada, was used for provincial planning purposes including PPE modelling. A provincial website for student education was developed and hosted by PHSA to provide a single source of information for multiple stakeholder groups. PHSA also contributed to the development of the provincial guideline: *Student Practice Education Guideline for Healthcare Settings during the COVID-19 Pandemic*, which emphasizes the importance of maintaining learning continuity in the preparation of the future workforce of the health system; articulates principles for both health and education sectors to adopt in planning and coordinating student placements; provides a process for decision-making about any potential significant delays or suspensions in placements; and clarifies the application of provincial Orders and Guidance to student education to support consistent practices across the province.

Placements were resumed in a staggered approach by discipline and sites. Students returning to on-site clinical placements in May 2020, included Preceptorships for Nursing, Psychiatric Nursing, Specialty Nursing, and Nurse Practitioners, Social Work, Unit Clerk, Sonography, Medical Lab Techs, Clinical Genetics Technologist, Public Health, and Pharmacy Technicians. Learning from this initial group of students, students in Respiratory Therapy, Radiation Therapy, Paramedics and Dietitians returned to on-site clinical placements in June 2020. Throughout the remainder of the summer, students from 3rd and 4th year Medical undergraduate program, 4th year Pharmacy, Physical Therapy

and Occupational Therapy were welcomed back to clinical settings. For the fall term, preparations were made to return to regular placement capacity for all disciplines with adjustments to scheduling, hours and group sizes, in accordance with site safety plans.

The resumption of student learning in clinical areas required extensive collaboration with all partners. Working groups were established at site/program, organizational and provincial levels to actively assess and prioritize placement requests, develop resources, identify emerging issues, resolve practice questions, ensure personal protective equipment (PPE) access and availability, and begin to design new approaches to clinical placements for priority professions and programs. To assist all who support student education, additional resources and supports were developed, including:

- Student Practice Education Guideline for Healthcare Settings during the COVID-19 Pandemic;
- collaborative decision-making process for pausing and resuming placements;
- operationalizing the PHO Orders and Guidance for student education,

In addition, PHSA hosted regular meetings and forums for cross-sector collaboration with representatives from all health organizations, post-secondary institutions, Ministry of Health and Ministry of Advanced Education and Skills Training to support establishing a shared understanding and consistent and coordinated approaches wherever possible.

More recently, PHSA has begun scenario planning for future clinical placements, establishing principles and guidelines to address strategies to mitigate the impact of potential future surges in COVID 19. And in collaboration with provincial student education partners, PHSA is examining clinical capacity, placement designs, alternate learning experiences and required competencies to explore new approaches to supporting student learning in evolving clinical circumstances.

There have been numerous challenges during the pandemic for all who support student practice education in BC. However, these challenges have also invited new collaborative approaches across both health and education sectors to find creative solutions, establish communication processes and platforms, and support the shared overall goal of preparing the future workforce of the health system.

PHSA is examining clinical capacity, placement designs, alternate learning experiences and required competencies to explore new approaches to supporting student learning in evolving clinical circumstances.

ONE OF CANADA'S LARGEST ACADEMIC HEALTH SCIENCE ORGANIZATIONS

PHSA CONTINUES AS A MAJOR RESEARCH AND EDUCATION ENTERPRISE

Despite the COVID-19 pandemic, annual metrics reflect the continued strength of PHSA's research and student education enterprise over the past fiscal year.

With total external funding of nearly \$140 million, a decrease of \$5.7 million over last year, PHSA continues to be one of the largest research hospitals in Canada. PHSA also plays a unique role in BC's health education system, providing specialized training placements often unavailable anywhere else in the province, to approximately 3000 students each year.

For the second year, these two critical dimensions of PHSA's tripartite mandate to deliver care, conduct research, and train students were reflected in PHSA's annual three-year service plan under Objective 3.6: *Commitment to the central position of science, evidence and education in wellness, care and policy.* Complementing the strategic plans of its research institutes, this objective was advanced primarily through initiatives and tools aimed at clarifying and streamlining legal and privacy requirements, and

Commitment to the central position of science, evidence and education in wellness, care and policy continues to be a key objective within PHSA's Service Plan.

data access for research purposes. These efforts were particularly important in facilitating the launch of clinical COVID-19 research and access to COVID-19 data for research.

The inclusion of this objective and realization of its strategies reflects and reinforces PHSA's commitment to its academic health science mandate, a mandate which continued to flourish this past year despite the challenges posed by COVID-19.

PHSA researchers attracted \$139.9 million in external funding in FY 2020/21, including \$9.5 million in COVID-19 research funding. Reflecting their competitive success, PHSA researchers surpassed the national average success rate in the Canadian Institutes of Health (CIHR) fall and spring operating grants. While the number of PHSA researchers fell in comparison to the previous year, from 832.5 to 769 researchers, the continued strength of PHSA's research enterprise is reflected in the number of research trainees which grew to 2,663 in comparison to 2,601 the prior year. PHSA researchers continue to publish prolifically, with the total number of publications up across all PHSA research entities. Revenues from the Research Support Fund, a federal funding program that supports the indirect costs of research, increased from \$4.06 million to \$4.1 million and, as noted previously, PHSA research entities received a total of \$8,658,231 from the Canada Research Continuity Emergency Fund (CRCEF).

PHSA continues to actively advance commercialization of research discoveries, and generated \$1,782,486 in IP revenue in FY 2020/21. This represents the largest IP revenues realized to date and is a significant increase compared to the \$525,697 realized last fiscal year. The number of inventions disclosed (40), the number of patents filed (20), and the number of licensing agreements (125) all increased, while the number of provincial patents (18) and PCT applications (7) filed decreased. The number of patents issued remained constant at 21. One new spinoff was created: Vita. Vita is a new start-up based out of California that uses technology created solely by the BC Cancer Research Institute and PHSA. The product is a light/optics technology that can be used for non-invasive rapid diagnosis of skin lesions. The underlying technology uses Raman spectroscopy to provide a chemical fingerprint of the suspicious lesion with the potential to use for other sites via endoscope such as GI. Vita is currently preparing to apply to the FDA for approval.

Despite interruptions caused by COVID-19, clinical trial activity remained constant across PHSA, with 657 active trials last year compared to 656 active trials in FY 2019/20. The number of enrolled subjects reduced slightly from 21,400 to 20,591 subjects.

These metrics reflect the resilience of PHSA's research strength in the face of COVID-19, and the passion and commitment of its research teams to both re-establish curtailed research activities as quickly as possible, and to optimize new research opportunities presented by the novel pandemic virus.

Quantitative metrics, however, tell only part of PHSA's success story. The impacts resulting from PHSA-led research are further illuminated through the top accomplishments and outcomes identified by each research entity in this report, and through the studies generated using PHSA's rich registry data sets.

As a result of its specialized services and the unique knowledge and expertise of its staff, PHSA also plays a critical role in supporting student education and preparing BC's future health workforce. Student practice education includes the learning activities that occur in health settings for students who are enrolled in a recognized academic institution who have a practicum as part of their program requirements.

PHSA supports clinical learning for students from all disciplines of the health care teams in its programs. In this report there is a decrease in both overall number of students and hours of student placements.

This is a reflection of the initial response to the COVID-19 pandemic and the subsequent resumption of learners in clinical settings in accordance with relevant policies and guidelines directing the safety and provision of care. It is through remarkable collaborative efforts that student education activities were not more affected throughout the fiscal year. A total of 2,782 students had placements at PHSA in the past fiscal year. Of these students, 451 were medical undergraduates (MDUG), 866 were enrolled in Post-Graduate Medical Education (PGME) or residency, 823 were nursing students, and 642 were all other members of the interprofessional team.

PHSA has education affiliation agreements with 69 academic partners to support these placements. The top five partners this year for the most student placement hours (excluding medical students' hours) are BC Institute of Technology (BCIT), University of British Columbia (UBC), Justice Institute of BC (JIBC), Thompson Rivers University, and Kwantlen Polytechnic University.

The student education metrics data allow for examination of the alignment among student education activities, workforce planning, and post-secondary program seat allocations. By enabling PHSA to monitor student activity by discipline, academic partner, and PHSA program, the data supports informed and strategic decisions.

RESEARCH IMPACTS AND OUTCOMES

PHSA-LED DISCOVERY IS MAKING A DIFFERENCE FOR PATIENTS

While quantitative metrics describe PHSA's academic health science mandate to a degree, the qualitative description of outcomes is needed to more fully understand how PHSA research is impacting patients, populations and the health system.

For the fourth year, PHSA research entities were asked to identify their top three accomplishments, giving them an opportunity to highlight key successes relevant to their differing foci, strengths and size. Many of the top three accomplishments this past year related to Covid-19, as already discussed. However, there were many others that reflected provincial, national and international level contributions in other domains.

Detailed in this report's program specific sections, examples of non COVID-19 key accomplishments include:

- establishment in BC of the first provincial lung screening program in Canada, a translation of years of dedicated research conducted by clinicians and researchers;
- refinement of a new approach to prevent transplant rejection by using genetically engineered versions of specialized immune cells called T regulatory cells (T regs);
- identification of an emerging trend of more people in BC smoking drugs instead of injecting them which led to establishment of inhalation overdose prevention services, provision of smoking supplies for clients, and additional research funding to support the needs of people who smoke drugs;
- opening of the newly constructed Skidmore Goodman Research Lab for Women's Health, a one-of-a-kind research facility that encompasses the Perinatal Research IMaging Evaluation (PRIME) Centre and the Women's Health Research Wet Lab onsite at BC Women's Hospital; and

BC established the first provincial lung screening program in Canada, a translation of years of dedicated research conducted by clinicians and researchers.

- awarding of the Marshall Postdoctoral Fellowship Award and Schizophrenia Endowment from the Institute of Mental Health (IMH) for a postdoctoral research fellow's fentanyl research project.

As in past years, PHSA research entities were asked to identify any guideline, drug, diagnostic agent or device adopted or approved in FY 2020/21 as a result of research driven by PHSA researchers, or collaborative research in which PHSA researchers were key participants. Recognizing that PHSA research entities function across the research spectrum from basic cell biology to clinical research to health system research, this year's report also reports for the first time research outcomes generated in the basic research domain. Research outcomes are innovations such as methodologies or software used in the conduct of research that have been developed by PHSA researchers and adopted or approved by other major entities in FY 2020/21.

COVID-19 played a major role in shaping this year's outcomes. PHSA research entities developed screens, diagnostic tests, tools and evidence-based guidelines that have aided BC and Canada in responding to the global pandemic. Examples of COVID-19 related outcomes, detailed in the program sections of this report, including the following.

- Researchers from the BCCDC Public Health Lab completed genomic sequencing of the COVID-19 virus and quickly evolved that sequencing into a routine public health service that has informed key decisions around restrictions and other public health measures resulting in reduced hospitalizations, ICU admissions and deaths due to COVID-19.
- A BC Children's Hospital researcher led a team that developed a new test to detect whether a patient's immune system had generated immune cells that were specific to SARS-CoV-2 after either a COVID-19 infection or after vaccination. These tests are currently being used to study the magnitude and longevity of vaccine responses in vulnerable patient populations.
- A BC Cancer researcher led the Canadian arm of a global consortium to model the impact of COVID-19 on cancer screening programs, treatments, and patient outcomes. The resulting government report will provide global health services research leadership for cancer systems both during the COVID-19 pandemic and in the years that follow.
- Three WHRI researchers were co-authors of a national clinical consensus statement: COVID-19 Vaccination in Pregnancy.
- A BCMHSURI researcher developed a consensus statement to help maintain access and safety for patients requiring a schizophrenia drug during the pandemic;

While the pandemic slowed research efforts in non-COVID-19 arenas, PHSA research entities still achieved outcomes that advanced care, treatment and prevention in many other areas. Examples of non-COVID-19 outcomes, further detailed in the program sections of this report, include the following.

- A BCMHSURI researcher participated in an international multidisciplinary panel of experts that developed the first treatment algorithm to streamline prescribing of psychopharmacological agents in individuals prenatally exposed to alcohol and/or with a diagnosis of fetal alcohol spectrum disorder (FASD).
- BCCDC-affiliated researchers used data from the SmartSexResource - a real-time chat service monitored by BCCDC nurses - to determine that anxiety about sexual health was common among chat users, and developed two resources to help manage that anxiety: 1) MindMapBC, an online database of mental health resources for clients accessing sexual health services and 2) Supporting and addressing anxiety in sexual health care: A resource for providers developed in concert with sexual health professionals.

PHSA research is being applied to guide BC's pandemic response and to improve the health of British Columbian, Canadian and international populations.

- BC Children’s Hospital researchers developed new pharmacogenetic diagnostic tests for the three most commonly used classes of medication for children — antibiotics, analgesics and mental health medications — to prevent adverse drug reactions and enhance drug effectiveness. These new tests, which use the genomic traits of a patient to predict whether treatment is likely to work or whether the patient is likely to experience adverse effects, have been made available to pediatricians across the province.
- A BC Cancer research team developed optical tools that clinicians can use to take a closer look at suspicious areas in the lung that appear abnormal during a lung cancer screening. These optical imaging tools are deployed during a bronchoscopy, a procedure where a clinician navigates a small (~5-7mm diameter) camera into the large airways of the lung to look at abnormal tissue.
- Based directly on a series of research findings from a WHRI investigator and her team, the BC Government set a mandate for the provincial Minister of Health to ensure free prescription contraception for all British Columbians.

PHSA’s large number of provincial registries and longitudinal data sets on services provided to specific populations and related outcomes is a major asset of PHSA. These rich data resources, unique in Canada, include a wealth of information that can be studied to gain insights on clinical outcomes and health system design. A survey of PHSA’s registry data stewards identified many research questions currently being addressed through registry data. Below are just a few examples, highlighting the tremendous research value of these datasets, and how they are being used to directly improve health outcomes and evaluate optimum care delivery models.

- Data from the BC Children’s Biobank are being used to better understand the characterization and regulation of normal and leukemic stem cells.
- BC Cardiac Registry data are being analyzed to determine whether use of two classes of medications is associated with a reduction in death or major adverse cardiovascular events in post-coronary artery bypass graft (CABG) surgery patients.
- Data from the Endometriosis and Pelvic Pain Interdisciplinary Cohort (EPPIC) are being used to determine if there are identifiable factors that influence surgical outcomes in patients who undergo conservative surgery versus hysterectomy.
- Data from the BCCDC COVID-19 dataset are being used to identify/explain if pre-existing health issues or risks have been exacerbated by COVID-19, or as a direct result of COVID-19 measures or orders.
- Deep learning approaches are being used to predict the presence or absence of chronic obstructive pulmonary disease from screening CT scans using data from the Lung Cancer Screening Program.
- PROMIS-Renal Registry data are being used to determine the impact of COVID-19 vaccination on chronic kidney disease populations.
- PROMIS-Transplant Registry data are being used to investigate whether use of the drug clazakizumab can slow or prevent the decline of transplanted kidney function and lengthen the time before patients with kidney transplants will require dialysis or another transplanted kidney.
- Data from the Screening Mammography Database are being used to identify some of the gaps and challenges related to restarting the screening program after the pandemic related closure.
- Hip and knee arthroplasty data from the Surgical Patient Registry are being used to review patients who had a hip or knee replacement and then went on to have a revision.
- Tumour Tissue Repository data are being used to explore the role of intratumoral B-cells in breast cancer.

PHSA’s rich data resources, unique in Canada, include a wealth of information that can be studied to gain insights on clinical outcomes and health system design.

- Data from the Perinatal Services BC Registry are being used to developing a multi-source surveillance system for Fetal Alcohol Spectrum Disorder and prenatal alcohol exposure (SSFASD/PAE) in Canada.
- BC Trauma Registry data are being used to explore the impact of trauma center accreditation on processes of care and clinical outcomes in North America.
- BCEHS Cardiac Arrest Registry data are being used to investigate patient survival and the recognition of agonal breathing in cardiac arrest.
- Data from the BCEHS Paramedic System Evaluation and Research Database (PSERD) are being used to investigate best practices in bystander and professional rescuer interventions to increase survival from opioid-related cardiac arrest.
- Data from the BC Cancer Registry are being used to examine epidemiology, treatment, and survival in young-onset colorectal cancer patients.

Discovery, innovation and the application of new knowledge generated by PHSA researchers is clearly making a difference, improving clinical outcomes and the effectiveness of BC's health system in myriad ways.

STUDENT EDUCATION IMPACTS AND OUTCOMES

PHSA LAUNCHES A THREE-YEAR STUDENT EDUCATION ROADMAP

PHSA launched a three-year Student Education Roadmap to situate PHSA as an exemplar in student education.

As detailed previously, the majority of impacts and outcomes in student education were shaped by COVID-19. With the arrival of the pandemic, many of the recommendations and key activities outlined in the Student Education Roadmap were expedited. Developed as part of its 2019-2020 Service Plan, PHSA launched a three-year Student Education Roadmap to situate PHSA as an exemplar in student education. The Roadmap identified the following eight recommendations:

1. Implement strategic planning processes for student education across PHSA
2. Adopt and optimize best practices for coordinating student placements
3. Establish an organizational approach to ensuring the delivery of quality student experiences
4. Expand the monitoring and evaluation of education activities and learning environments
5. Prepare students to meet the needs of patients throughout the health system
6. Strengthen effective partnerships to support student education
7. Establish a collaborative approach to provincial leadership for student education
8. Lead advancement and innovation in student education models, designs, approaches and practices

Progress was made this year on each of the recommendations, but particularly on Recommendation #6: Strengthen effective partnerships to support student education, and on Recommendation #7: Establish a collaborative approach for provincial leadership for student education, as highlighted below.

In November, in partnership with the Ministry of Health and the Ministry of Advanced Education and Skills Training, PHSA participated in the launch of the Provincial Practice Education Coordinating Committee (PPECC). This Committee is a strategic body established to coordinate student practice education challenges and responses at the systems-level, across nursing, allied health, and medical

professions. It is accountable to both ministries via the Planning Board for Health and Medical Education, and is intended to support resolutions and innovations to practice education in BC. Building upon the value of the Student Practice Education Guideline for Healthcare Settings during the COVID-19 Pandemic, PPECC has begun the creation of a first-ever provincial policy for student practice education to guide both post-secondary institutions (PSIs) and health care organizations (HCOs).

PHSA Chairs the Health Authority Practice Education Committee (HAPEC), comprised of representatives for student education from each health authority. HAPEC has responsibility to share knowledge, experience and resources across BC health authorities and establish standardized processes, and is accountable to the Provincial Nursing and Allied Health Council. This year, HAPEC met with increased frequency in order to be responsive to the iterative changes of the pandemic. Collaborative and consistent approaches to protocols, resources and communication related to students and on-site faculty and all the roles that support student education were a focus of HAPEC activities, and helped to support a shared understanding of the way forward in evolving circumstances, in order to support the resumption and continuation of learning activities. PHSA also has its own Student Education Coordinating Committee (SECC), with responsibilities for student education across PHSA sites and programs. Linkages between the SECC and HAPEC strengthened both the organizational and provincial approaches to student education.

Two additional contributions PHSA made to fostering a collaborative approach for provincial leadership in student education were the development and launch of a provincial website for student practice education as a one-stop shop for PSIs and HCOs, hosted on healthcarebc.ca domain (<https://spe.healthcarebc.ca/>), and hosting monthly information and planning webinars with PSIs, HCOs and government partners. Both the website and webinars have been well-received by provincial partners, with the website seeing 3000 visits in a three-month period, and with the webinars having 60 to 70 participants per session. The website and webinars are providing a unique opportunity for collaboration and information dissemination across all sectors.

Through the experiences of the past year, PHSA and its provincial partners are situated to strengthen our collective strategic planning, evaluation and support for student education. The pandemic highlighted where improvements and adjustments were needed and provided an extraordinary impetus for change.

PHSA and its provincial partners are situated to strengthen our collective strategic planning, evaluation and support for student education.

RESEARCH METRICS

PHSA OVERALL

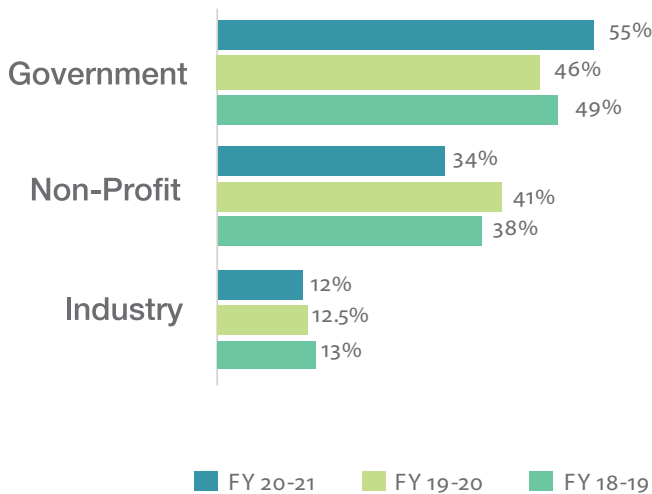


PRODUCING AND ADVANCING KNOWLEDGE

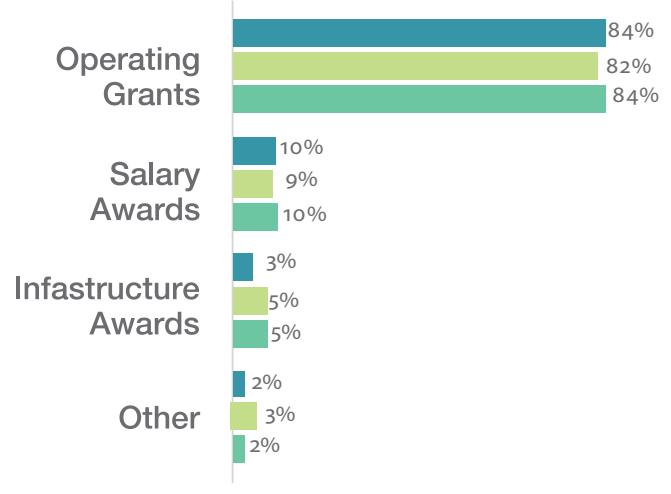
\$140 Million

in TOTAL GRANTS AWARDED in FY 20-21
\$146 Million in FY 19-20

\$ BY SECTOR



\$ BY AWARD TYPE



PUBLICATIONS

BCCHR	1,117
BCCRI	776
WHRI	950
BCCDC	243
BCMHSUS	133



100%

% of CIHR competitions above
National AVG SUCCESS RATE
in FY 20-21

100% in FY 19-20

ECONOMIC BENEFITS & INNOVATION

\$1.8M
of REALIZED REVENUE
in FY 20–21
\$526K in FY 19–20



15new
ACTIVE LICENSES
in FY 20–21
17 new in FY 19–20



20 patents filed
21 patents issued
in FY 20–21
11 Filed / 21 Issued in FY 19–20

18 spin-offs (1 new)
of ACTIVE SPIN-OFFS in FY 20–21
17 (3 new) in FY 19–20

BUILDING RESEARCH CAPACITY

952
OF RESEARCHERS
in FY 20–21
827.5 in FY 19–20



2,663
OF TRAINEES
in FY 20–21
2,601 in FY 19–20

\$4.1 Million
RESEARCH SUPPORT
FUND GRANTS
in FY 20–21
\$4.1 Million in FY 19–20

HEALTH & POLICY BENEFITS



657
OF CLINICAL TRIALS
in FY 20–21
656 in FY 19–20

20,951
TOTAL CUMULATIVE
SUBJECT ENROLLMENT
at the end of FY 20–21
21,400 at the end of FY 19–20



42%
% INDUSTRY FUNDED
TRIALS in FY 20–21
32% in FY 19–20

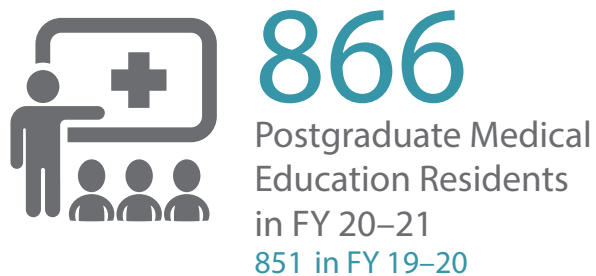
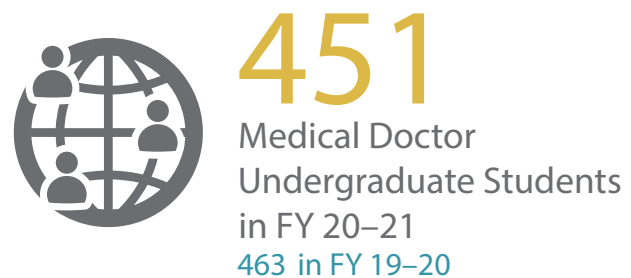
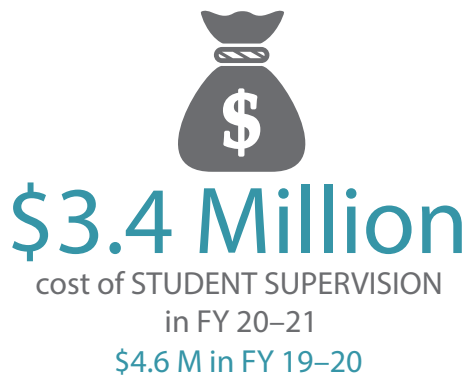
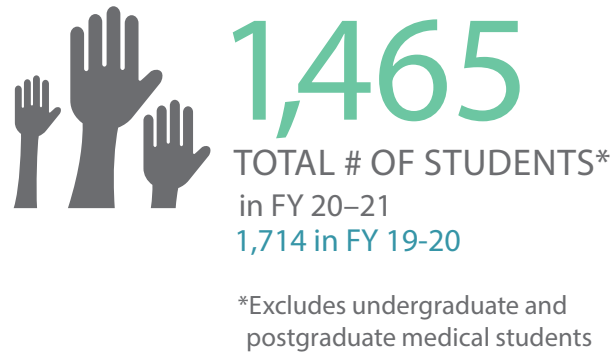
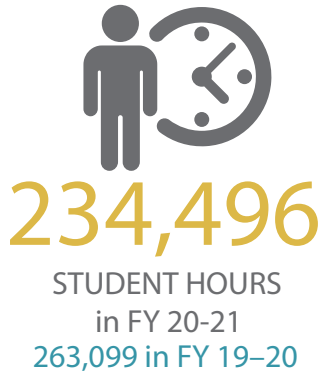
208 requests
193 approved
REGISTRY ACCESS REQUESTS/
APPROVALS in FY 20–21
236 requests / 226 approvals in FY 19–20

STUDENT EDUCATION METRICS

PHSA OVERALL



BUILD PRACTICE EDUCATION CAPACITY



BUILD EFFECTIVE PARTNERSHIPS & COLLABORATION TO SUPPORT INNOVATION



TOP EDUCATION INSTITUTIONS BY STUDENT HOURS in FY 20–21

1. BC Institute of Technology (57,646)
2. University of BC (39,573)
3. Justice Institute of BC (29,558)
4. Thompson Rivers University (20,062)
5. Kwantlen Polytechnic University (16,895)



DISTRIBUTION OF STUDENT HOUR by PRACTICE EDUCATION SETTING in FY 20–21

- Hospital (56%)
- On Car (15%)
- Outpatient/Mixed (23%)
- Other (6%)



38

of ACADEMIC PARTNERS WITH AN ACTIVE PLACEMENT in FY 20–21
38 in FY 19–20

QUALITY OF CLINICAL LEARNING ENVIRONMENT & RESULTS

TOP 5

TOP EDUCATION INSTITUTIONS FOR STUDENT PLACEMENT for NEW HIRES in FY 20–21

1. Justice Institute of BC (40)
2. BC Institute of Technology (27)
3. University of BC (23)
4. West Coast College of HealthCare (17)
5. Kwantlen Polytechnic University (15)



11%

of new hires with a PHS A PLACEMENT in FY 20–21
18% in FY 19–20



BC Cancer Research Institute (BCCRI)

RESEARCH METRICS
STUDENT EDUCATION METRICS

RESEARCH METRICS

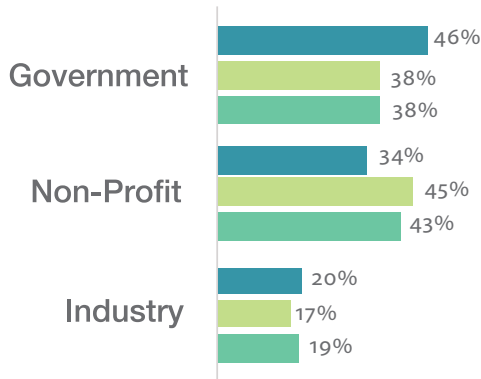
BCCRI

PRODUCING AND ADVANCING KNOWLEDGE

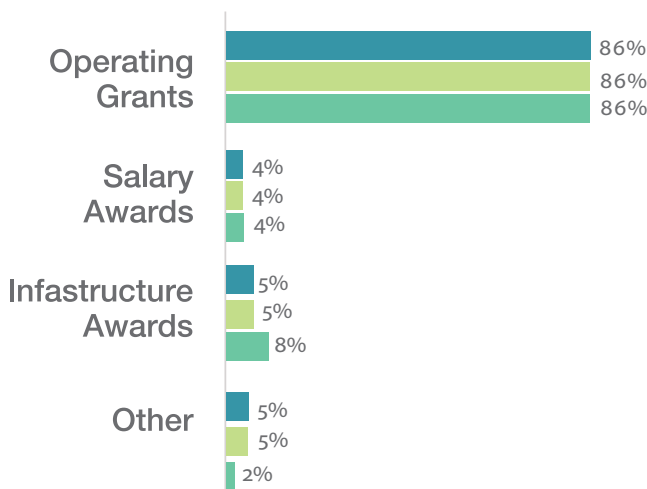
\$66 Million

in TOTAL GRANTS AWARDED in FY 20-21
\$76 Million in FY 19-20

\$ BY SECTOR



\$ BY AWARD TYPE



■ FY 20-21 ■ FY 19-20 ■ FY 18-19



776 TOTAL
OF PUBLICATIONS
in FY 20-21
744 in FY 19-20

659
JOURNAL ARTICLES
in FY 20-21
615 in FY 19-20

99%
PEER REVIEWED
in FY 20-21
99% in FY 19-20



0%
% of CIHR competitions
above National AVG
SUCCESS RATE
in FY 20-21
50% in FY 19-20

ECONOMIC BENEFITS & INNOVATION

\$665K
of REALIZED REVENUE
in FY 20-21
\$443K in FY 19-20



19 patents filed
20 patents issued
in FY 20-21
11 filed / 21 issued in FY 19-20



44
ACTIVE LICENSES
(5 new) in FY 20-21
7 new in FY 19-20

14 spin-offs (1 new)
of ACTIVE SPIN-OFFS in FY 20-21
13 (2 new) in FY 19-20

BUILDING RESEARCH CAPACITY

344.5
OF RESEARCHERS*
in FY 20-21
301 in FY 19-20



612
OF TRAINEES
in FY 20-21
732 in FY 19-20

\$1.5 Million
RESEARCH SUPPORT
FUND GRANTS
in FY 20-21
\$1.6 Million in FY 19-20

HEALTH & POLICY BENEFITS



362
OF CLINICAL TRIALS
in FY 20-21
370 in FY 19-20

6,982
TOTAL CUMULATIVE
SUBJECT ENROLLMENT
at the end of FY 20-21
8,344 at the end of FY 19-20



57%
% INDUSTRY FUNDED
TRIALS in FY 20-21
59% in FY 19-20



*excluding affiliate investigators

TOP 3 RESEARCH ACHIEVEMENTS BC CANCER



Details available in Supplementary Report

1

A formalized partnership and a new name: Announcing the BC Cancer Research Institute

BC Cancer Research formally became a research institute in partnership with the University of British Columbia (UBC) and the Provincial Health Services Authority (PHSA) – a move that enhances British Columbia’s leadership position in cancer research innovation. With a formalized partnership, the BC Cancer Research Institute (BCCRI) increases its strength as a hub for cancer research activity across the province, advancing cancer research discoveries and transformational technologies and treatments. The BCCRI is led by Dr. François Bénard, senior executive director, research, BC Cancer, and professor in the Department of Radiology and associate dean, research, UBC Faculty of Medicine. The move will also allow BCCRI to leverage existing resources and infrastructure to improve the health and wellbeing of British Columbians and beyond.

2

Launch of the first lung cancer screening program in Canada

BC Cancer researcher Stephen Lam and the province announced the first provincial lung screening program in Canada. The first-of-its-kind program comes from years of hard work and dedicated research by clinicians and researchers. By detecting and treating lung cancer in its early stage, survival outcomes for those who are diagnosed can be significantly improved. Once fully implemented by 2022, approximately 20,000 people per year will be provided lung cancer screening; it is hoped that this screening will lead to 340 diagnoses each year with more than 75 per cent of those cases diagnosed at an early stage when more treatment options are available. Following an initial lung screen, clinicians can further personalize screening or necessity for referral to specialty centres.

3

New method poised to improve diagnosis and treatment of bladder cancer

BC Cancer researchers published a study from over 100 patients of a blood-based minimally invasive ctDNA “liquid” biopsy method, comparing this new technique to patient-matched tumour tissue for identifying tumour-specific mutations in bladder cancer. The researchers demonstrated the liquid biopsy is sufficient to detect key tumour mutation events in ctDNA (circulating tumour DNA, which is DNA from the tumour that circulates in the bloodstream free from cells), suggesting future clinical protocols may be able to use less invasive blood draws to diagnose and treat bladder cancer. Bladder cancer is the tenth most common cancer and the sixth most common in men. Adoption of this new diagnostic strategy will offer potentially drastic clinical improvements for diagnosis and treatment of bladder cancer.

TABLE 1 BCCRI Outcomes


Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes  , and COVID-19 Related if icon appears.
<p>BC Cancer researcher Stephen Lam and the province announced the first provincial lung screening program in Canada. The first-of-its-kind program comes from years of hard work and dedicated research by clinicians and researchers, spearheaded by Dr. Stephen Lam, distinguished scientist, Leon Judah Blackmore Chair in lung cancer research, and director of the MDS/Rix Early Lung Detection Program at BC Cancer.</p>	<p>By detecting and treating lung cancer in its early stage, survival outcomes for those who are diagnosed can be significantly improved. Once fully implemented by 2022, approximately 20,000 people per year will be provided lung cancer screening; it is hoped that this screening in will lead to 340 diagnoses each year with more than 75 per cent of those cases diagnosed at an early stage when more treatment options are available.</p>	<p>Patients: Improvements in timely access to care</p> <p>System: Process of care- protocol implementation</p> <p> PHSA</p>
<p>BC Cancer researcher Dr. Pierre Lane and team developed optical tools that clinicians can use to take a closer look at suspicious areas in the lung that appear abnormal during a lung cancer screening. These optical imaging tools are deployed during a bronchoscopy, a procedure where a clinician navigates a small (~5-7mm diameter) camera into the large airways of the lung to look at abnormal tissue.</p>	<p>It is important to be able to visualize the size and shape of individual cells for the accurate detection of early cancers. These small imaging devices provide volumetric images of the airway walls, with almost cellular resolution, in the very small peripheral airways where many cancers are believed to originate.</p>	<p>Patient: Access to new treatment/technology</p>
<p>BC Cancer researcher Dr. Stuart Peacock is reviewing the overall cost of COVID-19 itself and its impact on the entire health system. Applied Research in Cancer Control (ARCC) and Dr. Peacock are leading the Canadian part of a global consortium to model the impact of COVID-19 on cancer screening programs, treatments, and patient outcomes.</p>	<p>This effort, spearheaded by the Union for International Cancer Control, will provide global health services research leadership for cancer systems both during the COVID-19 pandemic and in the years that follow. It is published as a government report: Renewing the Social Contract: Economic Recovery in Canada from COVID-19.</p>	<p>System: Knowledge dissemination</p> <p></p>
<p>BC Cancer researchers at the Genome Sciences Centre (GSC), are working to develop new non-proprietary reagents to support current and future COVID-19 testing in British Columbia. Dr. Martin Hirst, senior scientist at the GSC and associate director of UBC's Michael Smith Laboratory (MSL), is leading this project with support from Genome BC through its Rapid Response Funding for COVID-19 Research program.</p>	<p>This research is ensuring a secure supply of laboratory reagents needed in B.C. to maintain and expand its capacity for COVID-19 testing. These reagents will undergo further validation and production will be scaled-up to meet increased testing demands in the province. The establishment of molecular resources, protocols, and formulations to support large scale viral testing will also ensure that Canada is prepared to meet future pandemics, particularly in the case of any disrupted global supply chains. This has resulted in the development of automation capacity that is having direct impact on patient care through decreased turn-around-times and improved capacity for testing for emerging SARS-Cov-2 variants. The team has partnered with two Canadian companies (LuminUltra and BuiltSpace) to benchmark surface testing protocols for environmental monitoring of SARS-Cov-2.</p>	<p>System: Resource improvements</p> <p> BCCDC </p>

TABLE 1 BCCRI Outcomes (continued)

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>BC Cancer physician Dr. James Sidney at BC Cancer Surrey led a trial of a patient specific bladder filling target structure for imaging prostate cancer patients at the center.</p>	<p>Using this structure was shown to reduce unnecessary additional scans for these patients and improves treatment by removing subjective evaluations of bladder volumes. The study also highlighted some situations where using this structure could prevent some of these patients from having side effects related to excess radiation dose to their bladder. Moving forward, they will be adopting the use of this structure for all patients.</p>	<p>Patient: Protocols and guidelines</p>
<p>BC Cancer investigators Dr. Abraham Alexander and Dr. Winkle Kwan at BC Cancer Victoria led a study of Prostate Stereotactic Ablative Radiotherapy (SABR), a relatively new treatment modality for prostate cancer. SABR is a form of external beam radiotherapy (EBRT) that is much more convenient than conventional EBRT as it only requires 5 treatments, instead of 20-37 with conventional EBRT. In addition, SABR appears to be more effective with fewer side effects. The study began in 2016 with a randomized phase 2 trial comparing SABR to conventional EBRT (called the ASSERT study). This study has completed accrual but continues into the follow-up phase. The group has now published a couple of papers on the development of their specific treatment technique, and recently completed the analysis for the toxicity comparison for the ASSERT trial (data will be shown at CARO this year).</p>	<p>According to their results, the toxicity (side effects) and quality of life associated with SABR appears to be at least as favorable as conventional EBRT, perhaps more favorable. The ASSERT trial provided much experience in delivering prostate SABR and provided data to confirm it is well tolerated. This, combined with favorable studies done elsewhere, led the Provincial GU radiation oncology group to approve prostate SABR this year as a standard treatment option for prostate cancer in BC. Because it's a new option, SABR is currently being offered on a clinical registry so data can be tracked to gain more long-term data</p>	<p>Patient: Protocols and guidelines</p>
<p>BC Cancer investigators Dr. Abraham Alexander and Dr Jordan Wong lead the Limbus trial at BC Cancer Victoria. Limbus is a deep learning artificial intelligence (AI) algorithm for radiation treatment planning. For radiation treatment planning, one of the crucial steps involves delineating on computer the organs to avoid with radiation (called "contouring"). The process of contouring is time consuming, and requires a radiation therapist or radiation oncologist to go through each slice of a CT or MRI scan and draw out various organs (eg: bladder, bowel, kidney, etc). Limbus is an AI technique that can automate this process. The group has worked with folks from the Limbus company on research to train AI to take over the contouring task in an automated fashion.</p>	<p>This research started with validation studies to prove that the AI could do the job as well as humans, and then a workflow study to demonstrate that it could be incorporated into the workflow to save significant time. These studies have been published, and one of them won an award at CARO in 2020. Because of these studies demonstrating that Limbus can effectively contour and save time, Limbus has now been incorporated it into regular workflow at the Victoria centre. Now all prostate, head and neck, and brain radiation plans use Limbus to contour the radiation planning images routinely. More research will be continued into Limbus to find other aspects of treatment planning and delivery where it can be used to save oncologist and therapist time.</p>	<p>Patient: Access to new treatment/ technology</p>

TABLE 1 BCCRI Outcomes (continued)

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) and COVID-19 Related if icon appears.
<p>For endometrial cancer, universal testing is now done for MMR and p53 in BC. Molecular classification of endometrial cancer – based on research by the OVCARE group has resulted in changes to clinical guidelines as reflected in publications in “UpToDate” and changes to WHO guidelines and NCCN.</p>	<p>Molecular classification enables stratification of risk and directs care.</p>	<p>Patient – changes in clinical guidelines and standard of care</p>
<p>For vulvar squamous cell carcinoma, universal testing is now done for p16 and p53 in BC.</p>	<p>Molecular classification enables stratification of risk and directs care.</p>	<p>Patient – changes in clinical guidelines and standard of care</p>
<p>The latest edition of the World Health Organization Classification of Female Genital Tract Tumours (“WHO Blue Book”) published in September 2020 was highly influenced by the work of OVCARE’s research. This includes progress of the classification of tumors of the ovary, fallopian tube, endometrium and vulva.</p> <ul style="list-style-type: none"> • The team published a series of studies demonstrating that there are five subtypes of ovarian carcinoma and that these differ with respect to risk factors, response to therapy and outcomes. The importance of ovarian carcinoma subtypes has opened the door to new treatments and prevention strategies that are subtype specific. • Sex cord-stromal tumors of the ovary are uncommon and were poorly understood until a series of landmark studies from OVCARE described the molecular abnormalities that characterize adult granulosa cell tumor, the most common malignant tumor in this category, as well as Sertoli-Leydig cell tumor, a closely related tumor. • OVCARE developed a molecular classifier for endometrial carcinoma (referred to as the Proactive Molecular classifier of Endometrial Carcinoma, or ProMisE), and the transformational nature of this discovery is reflected in the 2020 WHO Blue Book. • The team published a series of studies showing that the vulvar carcinomas unrelated to Human Papillomavirus have a worse prognosis than those where Human Papillomavirus is involved in tumor formation. This has important implications for treatment and the classification of vulvar carcinoma in the 2020 WHO Blue Book has been completely overhauled to reflect this. 	<p>Progress on the classification of gynecological cancers. OVCARE’s research has set the global standard for research and care.</p>	<p>Patient – changes in clinical guidelines and standard of care</p>

STUDENT EDUCATION METRICS

BC CANCER

BUILD PRACTICE EDUCATION CAPACITY



STUDENT HOURS
in FY 20–21
28,229 in FY 19–20



104

TOTAL # OF STUDENTS*
in FY 20–21
106 in FY 19–20

*Excludes undergraduate and postgraduate medical students



\$347,683

COST OF STUDENT SUPERVISION
in FY 20–21
\$393,080 in FY 19–20



112

Medical Doctor
Undergraduate Students
in FY 20–21
129 in FY 19–20



18

PRECEPTORS had an active
placement in FY 20–21
21 in FY 19–20



210

Postgraduate Medical
Education Residents
in FY 20–21
221 in FY 19–20

••• BUILD EFFECTIVE PARTNERSHIPS & COLLABORATION TO SUPPORT INNOVATION



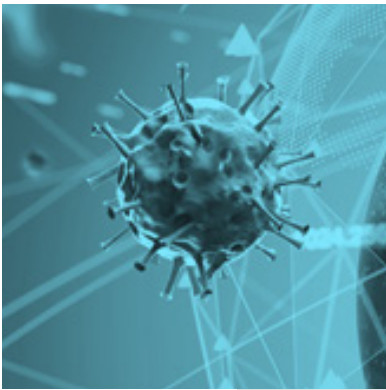
TOP EDUCATION INSTITUTIONS BY
PLACEMENT HOURS in FY 20–21

1. BC Institute of Technology (18,728)
2. University of BC (1,652)
3. Vancouver Community College (900)
4. University of Victoria (619)
5. Camosun College/University of Victoria (540)



14

of ACADEMIC PARTNERS
WITH AN ACTIVE PLACEMENT
in FY 20–21
11 in FY 19–20



BCCHR/BC Children's Hospital and Sunny Hill Health Centre

RESEARCH METRICS
STUDENT EDUCATION METRICS

RESEARCH METRICS

BC CHILDREN'S HOSPITAL RESEARCH INSTITUTE

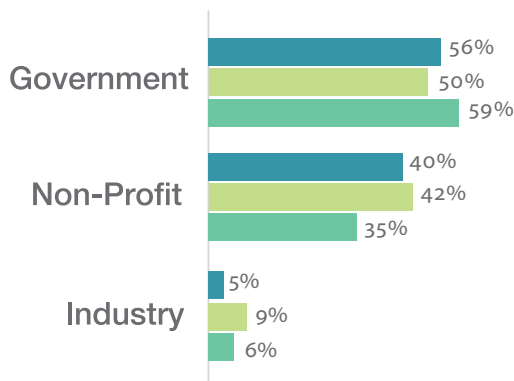


PRODUCING AND ADVANCING KNOWLEDGE

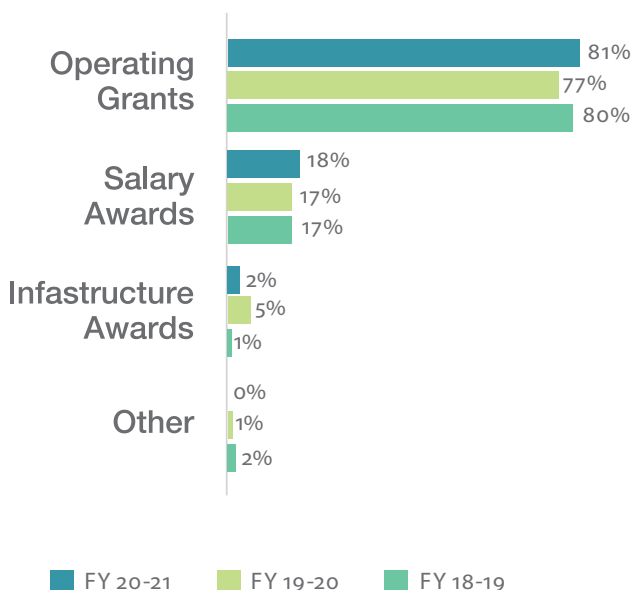
\$61.6 Million

in TOTAL GRANTS AWARDED in FY 20-21
\$58.4 Million in FY 19-20

\$ BY SECTOR



\$ BY AWARD TYPE



1,117 TOTAL
OF PUBLICATIONS
in FY 20-21
1,060 in FY 19-20

967
JOURNAL ARTICLES
in FY 20-21
923 in FY 19-20

99%
PEER REVIEWED
in FY 20-21
99% in FY 19-20



100%
% of CIHR competitions
above National AVG
SUCCESS RATE
in FY 20-21
100% in FY 19-20

ECONOMIC BENEFITS & INNOVATION

\$1.1M
of REALIZED REVENUE
in FY 20-21
\$93K in FY 19-20



0 patents filed
2 patents issued
in FY 20-21
2 filed, 4 issued in FY 19-20



81
ACTIVE LICENSES
(10 new) in FY 20-21
10 new in FY 19-20

4 spin-offs (0 new)
of ACTIVE SPIN-OFFS in FY 20-21
4 (1 new) in FY 19-20

BUILDING RESEARCH CAPACITY

303.5
OF RESEARCHERS*
in FY 20-21
297 in FY 19-20



228
OF CLINICAL TRIALS
in FY 20-21
200 in FY 19-20



709
OF TRAINEES
in FY 20-21
849 in FY 19-20

8,855
TOTAL CUMULATIVE
SUBJECT ENROLLMENT
at the end of FY 20-21
5,632 in FY 19-20



\$2.1 Million
RESEARCH SUPPORT
FUND GRANTS
in FY 20-21
\$1.9 Million in FY 19-20



24%
% INDUSTRY FUNDED TRIALS
in FY 20-21
59% in FY 19-20

*Excluding affiliate investigators

TOP 3 RESEARCH ACHIEVEMENTS

BC CHILDREN'S HOSPITAL RESEARCH INSTITUTE



Details available in Supplementary Report

1

BC Children's Hospital Researchers develop less invasive and more comfortable COVID-19 test

BC Children's Hospital investigators, in collaboration with BC Centre for Disease Control colleagues, led research efforts that culminated in a new COVID-19 test that involves less invasive saline gargle samples rather than nasopharyngeal swabs. This new mouth rinse and gargle sample collection method for COVID-19 testing was officially announced on Sept. 17, 2020 and provides an alternative for children in B.C. to the traditional swab test of the upper part of the throat behind the nose, which many find uncomfortable.

2

New study helps improve bespoke immune cells' ability to prevent transplant rejection in patients with donated tissue

When sick children require an organ transplant, they usually also need immunosuppressive drugs to keep their immune system from attacking the donated cells or tissues. Unfortunately, these medications can leave patients more vulnerable to subsequent infections or other diseases. BC Children's Hospital research further refined a new approach to preventing transplant rejection by using genetically engineered versions of specialized immune cells called T regulatory cells (T regs). These modified cells can dampen down the immune system should it mount a response to transplanted tissues. This study systematically investigated several potential ways to manipulate these T regs to ensure the development of the best possible therapy for these patients.

3

BC Children's Hospital Researchers improve accuracy of epilepsy diagnosis and treatment

Different types of pediatric epilepsy are diagnosed based on age of onset, seizure triggers, time of day when seizures occur, and brain scan results. Self-limited epilepsies tend to respond well to seizure medication and eventually subside by a certain age. Non-self-limited epilepsies, on the other hand, are lifelong conditions that may worsen over time. It's not always clear which type of epilepsy a child has. BC Children's researchers looked at 26 years of data from pediatric epilepsy patients that helped them identify clinical and brain imaging features that show up in certain types of epilepsy. They found that the presence of a specific EEG characteristic and eye movements during a seizure are together predictive of self-limited epilepsy. This information can aid clinicians in providing patients and their families with more accurate details regarding epilepsy type, as well as treatment strategies tailored to the individual.

TABLE 2 BCCHR Outcomes

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>BC Children’s Hospital researchers including Dr. David Goldfarb and Dr. Jocelyn Srigley led research efforts that culminated in a new COVID-19 test that involves less invasive saline gargle samples rather than nasopharyngeal swabs. This new mouth rinse and gargle sample collection method for COVID-19 testing was officially announced on Sept. 17, 2020.</p> <p>Dr. Goldfarb travelled across the province to the homes of people who had tested positive for COVID-19 to collect samples in the early days of the pandemic.</p>	<p>This new rinse and gargle method is an alternative for children in B.C. to the traditional swab test, which starts in the nose and ends in the upper part of the throat, and which many find uncomfortable</p>	<p>Patient: Access to new treatment/ technology</p> <p> BCCDC </p>
<p>Investigators at BC Children’s Hospital developed and implemented a new second-tier test for three different metabolic disorders in newborns. The new test is more likely to identify babies with one of these metabolic disorders, but without an increase in the rate of false positives. As of December 2020, this test is now routine for all newborns in the province (45,000 per year).</p>	<p>This new test was shown to be more accurate and helped detect newborns with nutritional vitamin B12 deficiency related to maternal deficiencies that were not previously identifiable.</p> <p>Untreated, persistent B12 deficiency can negatively impact long-term development, so identification of this deficiency and supplementation of B12 allow for improved outcomes for affected children.</p>	<p>Patient: Access to new treatment/ technology</p>
<p>BC Children’s Hospital investigators Dr. Graham Sinclair and Dr. Hilary Vallance led a 10-year review of the performance and outcomes of the Provincial Newborn Screening Program for Cystic Fibrosis. By the end of March 2020, this review had led to evidence-based changes to several aspects of the screening algorithm.</p>	<p>This work led to changes to the Cystic Fibrosis Newborn screening algorithm for newborns and families in B.C. Changes made to the screening algorithm minimized the need for repeated testing and the need to travel for testing during the COVID-19 pandemic.</p> <p>Thanks to the review, a segment of retesting that had yielded no confirmed cases in the last decade was removed.</p> <p>In-person sweat tests were also replaced with expanded genetic analyses to exclude cystic fibrosis in low-risk individuals. This modification eliminated the need to travel to BC Children’s Hospital for testing.</p>	<p>System: Process of care-protocol implementation</p> <p> CF Clinic </p>
<p>BC Children’s Hospital researcher Dr. Graham Sinclair along with Dr. Sandesh Shivananda led a reassessment of the current newborn screening methods for congenital hypothyroidism in premature and sick infants in the neonatal intensive care unit (NICU) at BC Children’s Hospital. If untreated, congenital hypothyroidism results in a severe deficiency in thyroid hormones that can cause impaired neurological function, stunted growth, and physical deformities. As a result of this audit, the screening method for this condition was changed so that the birth weight and age of the infant are considered when the sample is collected.</p>	<p>These process changes enabled the screening tests to be more sensitive to smaller changes in thyroid hormone levels in premature and low birth weight infants, which can ultimately help identify infants with this condition sooner. Identifying whether an infant has congenital hypothyroidism early is critical for proper treatment of this condition.</p> <p>If caught early and correctly treated, most children with congenital hypothyroidism will grow and develop normally.</p>	<p>Patient: Improvement in timely access to care</p> <p> BCCH</p>

TABLE 2 BCCHR Outcomes (continued)






Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>A new clinical tool called “The Genomic Results E-booklet” was co-developed by investigators at BC Children’s Hospital and parents to help families cope with the results of genetic tests. After being provided with genomic results, families have described feeling lost, abandoned, and unsure of what happens next. This tool aims to help families navigate their next steps. In June 2020, The Genomic Results E-booklet was first used in a clinical setting to address this need. The booklet provides customized information, support, and direction to families. It is available in five languages and written at an accessible Grade 7 level.</p>	<p>To date, the booklet has been used by around 80 families in a clinical research study and has been well received by clinicians and families alike.</p>	<p>Patient: Access to new treatment/ technology</p>
<p>During the COVID-19 pandemic, BC Children’s Hospital researcher Dr. Ted Steiner led a team that developed a new test to detect whether a patient’s immune system had generated immune cells that were specific to SARS-CoV-2 after either a COVID-19 infection or after vaccination.</p>	<p>These tests are currently used to study the magnitude and longevity of vaccine responses in vulnerable patient populations.</p>	<p>Patient: Protocols and guidelines</p> <p> </p>
<p>BC Children’s Hospital researcher Dr. Quynh Doan and her research team validated the MyHEARTSMAP self-assessment psychosocial tool for children and parents to screen for and address mental health concerns. During the COVID-19 pandemic, the team used this tool to assess B.C. children and youth’s psychosocial states. To date, 425 participants have completed baseline mental health screening.</p>	<p>Preliminary data will be shared with the Ministry for Mental Health and Substance Use and the Ministry for Child and Family Development to prepare for adequate mental health support upon children’s return to school in September.</p>	<p>Patient: Improvements in timely access to care</p> <p></p>
<p>BC Children’s Hospital investigator Dr. Jennifer Coehlo co-authored virtual care recommendations for pediatric eating disorders in the context of the COVID-19 pandemic as part of the Canadian Consensus Panel for pediatric eating disorders. The recommendations followed up on guidelines the panel developed in 2020, which she also co-authored.</p>	<p>The project aimed to develop Canadian Practice Guidelines for the virtual treatment of children, adolescents, and young adults with eating disorders. These recommendations for therapeutic approaches were included, based on this evidence, and gaps in existing research were identified.</p>	<p>Patient: Protocols and guidelines</p> <p></p>
<p>BC Children’s Hospital researchers developed new pharmacogenetic diagnostic tests for the three most commonly used classes of medication — antibiotics, analgesic and mental health medication — to prevent adverse drug reactions and enhance drug effectiveness. These new tests use the genomic traits of a patient to predict whether treatment is likely to work or whether the patient is likely to experience adverse effects. In the spring of 2020, these tests were made available to pediatricians across the province so they could order these tests for the children in their care.</p>	<p>Pharmacogenetic test results are ordered and returned for each individual patient to determine the best prescription of medication for that patient based on their genetic predisposition to adverse drug reactions and medication effectiveness. This benefits the patients, physicians, and the system by reducing the chance of ineffective therapy and serious adverse drug reactions.</p>	<p>Patient: Access to new treatment/ technology</p>

TABLE 2 BCCHR Outcomes (continued)

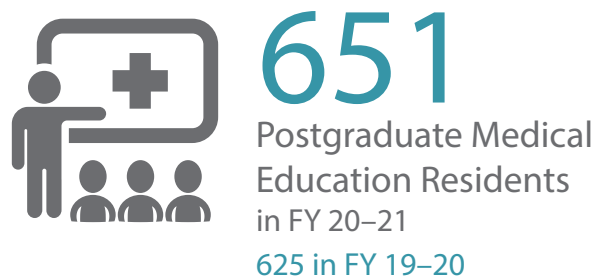
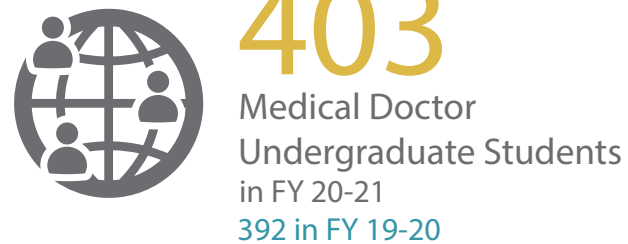
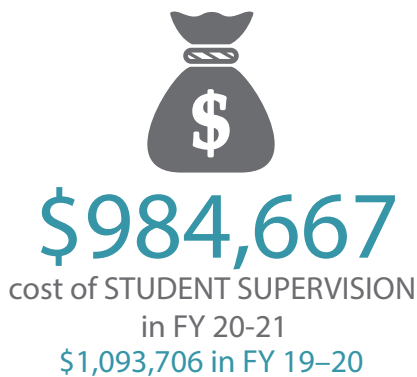
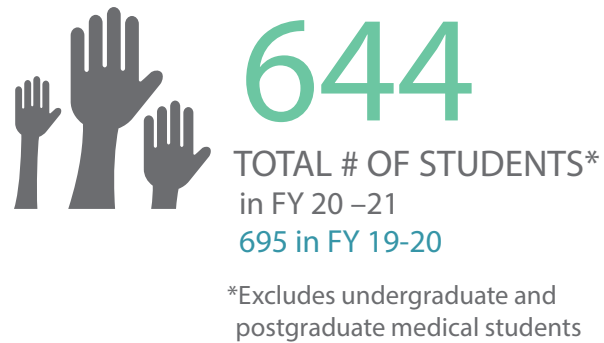
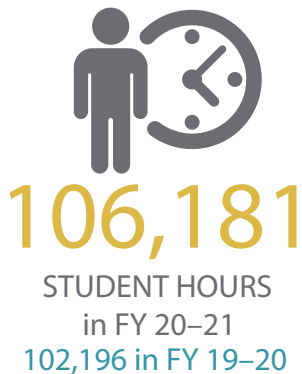
Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>BC Children’s Hospital researchers led by Dr. Jill Zwicker created a developmental coordination disorder (DCD) toolkit for pediatricians that consolidates current evidence for diagnosis and management of children with DCD.</p> <p>The toolkit was distributed to every member of the BC Pediatric Society and was posted on the resources page on the BC Pediatric Society website, as well as the Child Development and Rehabilitation Evidence Centre website.</p> <p>To translate this knowledge nationally, Dr. Zwicker collaborated with two developmental pediatricians to author a Canadian Paediatric Society (CPS) Practice Point, which will be published in Paediatrics and Child Health. Dr. Zwicker and her team have also been invited to provide a grand rounds presentation at CPS in October 2021.</p>	<p>DCD is a common but under-recognized and under-diagnosed neurodevelopmental disorder that affects one in 20 children, or more than 450,000 in Canada.</p> <p>DCD affects a child’s ability to learn motor skills, such as managing buttons and zippers, using a knife and fork, printing/handwriting, swimming, riding a bicycle and learning to drive. DCD can affect self-care, school achievement, vocational choices, and leisure activities. DCD tends to persist into adulthood and often leads to secondary mental health concerns, such as depression and anxiety, overweight/obesity, and poorer health-related quality of life.</p> <p>Without a diagnosis, children with DCD are misunderstood, do not receive support or intervention and are unable to reach their full potential. Diagnosis is the first critical step to increase awareness of this disorder and to advocate for better services and standard of care in order to improve the developmental trajectory and negative outcomes associated with DCD. The initiatives undertaken by Dr. Zwicker and her team inform the community and developmental pediatricians of the importance of a DCD diagnosis and guidelines on how to recognize and diagnose this disorder.</p>	<p>System: Process of care standardization</p>
<p>BC Children’s Hospital researchers, including Dr. Bruce Carleton, developed a drug-safety referral clinic called Med Safe at St. Paul’s Hospital to address adverse drug events. In the summer of 2020, this clinic, supported by the Department of Medicine at St. Paul’s Hospital, began hosting regular clinical sessions through referrals from subspecialists. Using new tools such as human leukocyte antigen genotyping and lymphocyte toxicity tests, this multidisciplinary clinic, which involves dermatology, immunology, and clinical pharmacology, can help determine the specific drug or drugs that are most likely responsible for adverse events and make recommendations to improve the safe use of drugs for patients.</p>	<p>The goal beyond identifying which drug has caused a significant reaction is to narrow the list of suspect drugs on a patient’s drug allergy list and improve care for patients.</p>	<p>Patient: Access to new treatment/ technology</p>

STUDENT EDUCATION METRICS

BC CHILDREN'S HOSPITAL AND SUNNY HILL HEALTH CENTRE



BUILD PRACTICE EDUCATION CAPACITY



••• BUILD EFFECTIVE PARTNERSHIPS & COLLABORATION TO SUPPORT INNOVATION



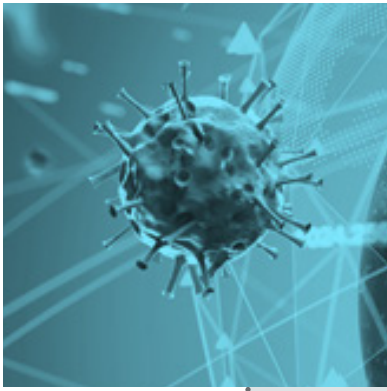
TOP EDUCATION INSTITUTIONS BY
PLACEMENT HOURS in FY 20–21

1. University of BC (25,436)
2. BC Institute of Technology (23,169)
3. Thompson Rivers University (18,620)
4. Douglas College (10,782)
5. Kwantlen Polytechnic University (7,482)



18

of ACADEMIC PARTNERS
WITH AN ACTIVE PLACEMENT
in FY 20–21
26 in FY 19–20



BCMHSUS Research Institute/BC Mental Health & Substance Use Services

RESEARCH METRICS
STUDENT EDUCATION METRICS



RESEARCH METRICS

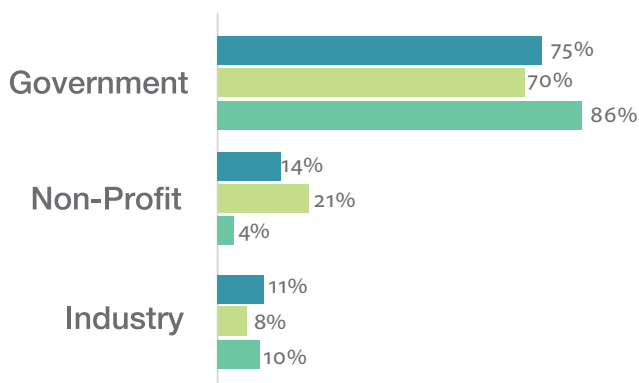
BC MENTAL HEALTH & SUBSTANCE USE SERVICES RESEARCH INSTITUTE

PRODUCING AND ADVANCING KNOWLEDGE

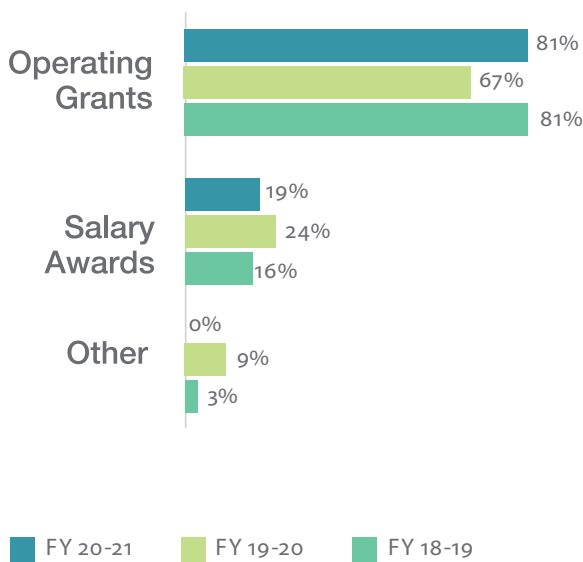
\$1.25 Million

in TOTAL GRANTS AWARDED in FY 20-21
\$1.24 Million in FY 19-20

\$ BY SECTOR



\$ BY AWARD TYPE



133 TOTAL
OF PUBLICATIONS
in FY 20-21
127 in FY 19-20

129
JOURNAL ARTICLES
in FY 20-21
120 in FY 19-20

97%
PEER REVIEWED
in FY 20-21
95% in FY 19-20



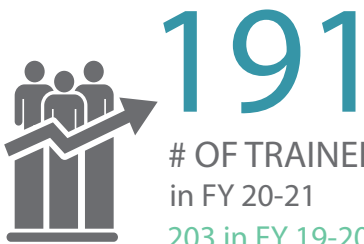
0%
% of CIHR competitions
above National AVG
SUCCESS RATE
in FY 20-21
50% in FY 19-20



BUILDING RESEARCH CAPACITY

15.5

OF RESEARCHERS*
in FY 20-21
16 in FY 19-20



OF TRAINEES
in FY 20-21
203 in FY 19-20

\$135K

RESEARCH SUPPORT
FUND GRANTS
in FY 20-21
\$161K in FY 19-20

*excluding affiliate investigators

HEALTH & POLICY BENEFITS



OF CLINICAL TRIALS
in FY 20-21
7 in FY 19-20

551

TOTAL CUMULATIVE
SUBJECT ENROLLMENT
at the end of FY 20-21
565 at the end of FY 19-20



0%

% INDUSTRY FUNDED
TRIALS in FY 20-21
0% in FY 19-20

ECONOMIC BENEFITS & INNOVATION



0

ACTIVE LICENSES
in FY 20-21
7 active (0 new) in FY 19-20

TOP 3 RESEARCH ACHIEVEMENTS BCMHSUS RESEARCH INSTITUTE



Details available in Supplementary Report

1

BCMHSUS PhD receives the Marshall Postdoctoral Fellowship Award and Schizophrenia Endowment from the Institute of Mental Health

Dr. Melissa Woodward, a postdoctoral research fellow with Dr. William Honer, won the Marshall Postdoctoral Fellowship Award and Schizophrenia Endowment from the Institute of Mental Health (IMH) for her project: "The age of Fentanyl – Overdose, Hypoxia, and Microvascular Damage." This work was also awarded the Djavad Mowafaghian Centre for Brain Health (DMCBH) 2020 Endowment Award.

2

PhD candidate wins the 2020 Vanier Scholarship for his work with traumatic brain injury and individuals who are homeless and precariously housed




Jacob Stubbs received the CIHR Doctoral Award (Frederick Banting and Charles Best Canada Graduate Scholarship) and 2020 Vanier Scholarship for his work: "Longitudinally evaluating the impact of traumatic brain injury on the brain structure and health of individuals who are homeless and precariously housed." Mr. Stubbs is supervised by Dr. William Honer and Dr. William Panenka, BCMHSUS researchers who continue to run the Hotel Study: a longitudinal investigation of public health issues and access to public health systems in Vancouver's downtown eastside population. This research team was awarded a new CIHR grant in April 2020: "Neuropsychiatric complications of co-morbid illness in people living in homeless and precarious housing." Their recent research indicates a high prevalence of co-occurring addiction, mental and physical illness in people living in homelessness or precarious housing with a mortality rate over eight times higher than a Canadian sample matched for age and gender. Through neurological, cognitive, and brain imaging studies, they will learn how these risk factors act on the brain and identify targets for early intervention and rehabilitation.

3

Online medication switching tool SWITCHRX.CA continues to grow and support clinicians across the country

Dr. Ric Procyshyn, a clinical research psychopharmacologist at BCMHSUSRI and Dr. Diane McIntosh (Dalhousie University) co-developed an online medication switching tool to provide healthcare professionals with the most current and useful information to guide their clinical practice when adjusting their patients' psychotropic treatment regimens. This resource, SWITCHRX.CA features suggestions for tapering and titration schedules, clinical tips, detailed information on drug pharmacokinetics, and other precautions. SWITCHRX.CA has over 40,000 users with approximately 500 visits/day and 50 new subscribers/day. Dr. Procyshyn is also the principal editor for: "The Clinical Handbook of Psychotropic Drugs", which is currently published in five languages (i.e., English, Korean, German, Romanian, and Chinese) and was cited 565 times. Dr. Procyshyn has been awarded several teaching awards from the Faculty of Pharmaceutical Sciences, University of British Columbia and acts as a consultant for the BC Psychosis Program.

TABLE 3 BCMHSUS Outcomes

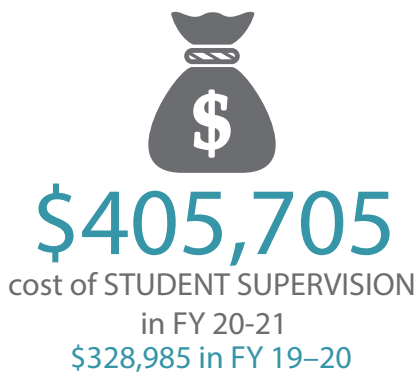
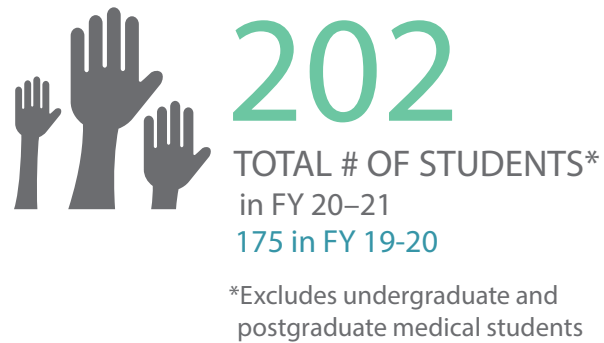
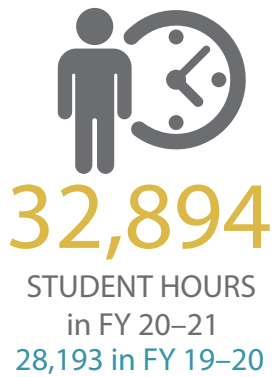
Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>A BCMHSUS researcher takes part in a multidisciplinary panel of experts to create a treatment algorithm to streamline prescribing for individuals exposed to alcohol and/or with a diagnosis of fetal alcohol spectrum disorder (FASD).</p>	<p>An international multidisciplinary team develops the first treatment algorithm for the use of psychopharmacological agents in individuals prenatally exposed to alcohol and/or with a diagnosis of fetal alcohol spectrum disorder (FASD). Psychotropic medication treatment for these individuals has lagged behind psychosocial interventions and despite diverse comorbid mental disorders, there are no specific guidelines. This work presents a treatment algorithm to simplify and improve the pharmacological treatment of individuals with FASD by reducing side effects and medication noncompliance.</p>	<p>Patient: Other - Improved pharmacotherapy Patient: Protocols and guidelines</p> <p> BCCHR</p>
<p>A BCMHSUS researcher develops a consensus statement to help maintain access and safety for patients requiring clozapine during the pandemic.</p>	<p>Clozapine is under-utilized and requires careful monitoring for those experiencing treatment-refractory schizophrenia. The consensus statement was created to help maintain access, and safety for patients during the COVID-19 pandemic. Discontinuing clozapine, especially abruptly for patients presenting with symptoms of COVID infection, creates significant risk of relapse or exacerbation of severity of illness and needs to be avoided.</p>	<p>Patient: Other - Improved pharmacotherapy Patient: Protocols and guidelines</p> <p></p>



STUDENT EDUCATION METRICS

BC MENTAL HEALTH & SUBSTANCE USE SERVICES

BUILD PRACTICE EDUCATION CAPACITY





••• BUILD EFFECTIVE PARTNERSHIPS & COLLABORATION TO SUPPORT INNOVATION



TOP EDUCATION INSTITUTIONS BY
PLACEMENT HOURS in FY 20-21

1. University of BC (7,334)
2. Kwantlen Polytechnic University (5,382)
3. Douglas College (3,840)
4. University of Victoria (2,890)
5. Stenberg College (2,700)



21

of ACADEMIC PARTNERS
WITH AN ACTIVE PLACEMENT
in FY 20-21
18 in FY 19-20



BC Centre for Disease Control/UBC CDC

RESEARCH METRICS
STUDENT EDUCATION METRICS

RESEARCH METRICS

BC CENTRE FOR DISEASE CONTROL/UBC CDC



BC Centre for Disease Control
An agency of the Provincial Health Services Authority

PRODUCING AND ADVANCING KNOWLEDGE

\$7.5 Million

in TOTAL GRANTS AWARDED in FY 20-21
\$3.7 Million in FY 19-20



243 TOTAL
OF PUBLICATIONS
in FY 20-21
161 in FY 19-20

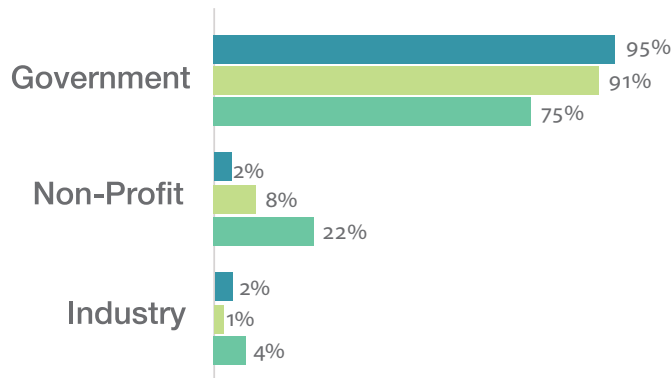
92
JOURNAL ARTICLES
in FY 20-21
110 in FY 19-20

55%
PEER REVIEWED

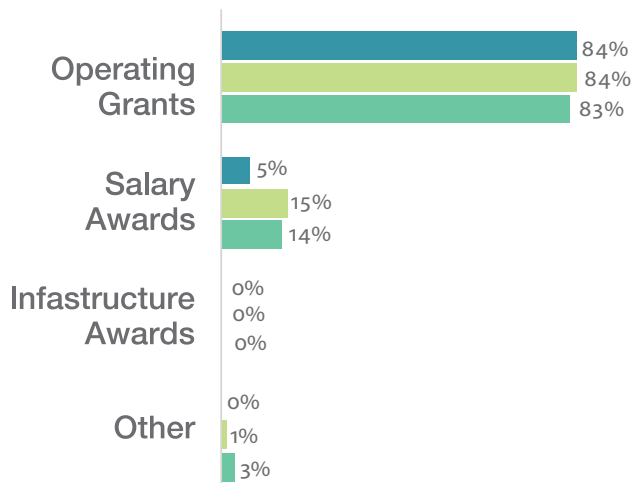


50%
% of CIHR competitions
above National AVG
SUCCESS RATE
in FY 20-21
100% in FY 19-20

\$ BY SECTOR



\$ BY AWARD TYPE



■ FY 20-21 ■ FY 19-20 ■ FY 18-19

BUILDING RESEARCH CAPACITY

42.5

OF RESEARCHERS*
in FY 20-21
34.5 in FY 19-20



90

OF TRAINEES
in FY 20-21
81 in FY 19-20

\$ 150K

RESEARCH SUPPORT
FUND GRANTS
in FY 20-21
\$129K in FY 19-20

**Excluding affiliate investigators

HEALTH & POLICY BENEFITS



12

OF CLINICAL
TRIALS in FY 20-21
11 in FY 19-20

1,663

TOTAL SUBJECT
ENROLLMENT
in FY 20-21
2,961 in FY 19-20



0%



% INDUSTRY FUNDED
TRIALS in FY 20-21
0% in FY 19-20

ECONOMIC BENEFITS & INNOVATION

No activity in FY 20-21

TOP 3 RESEARCH ACHIEVEMENTS BCCDC/UBC CDC



Details available in Supplementary Report

1

BCCDC Exceptional in Test, Trace, and Treat, to Lead the COVID-19 Pandemic Response

The backbone of pandemic response is: test, trace, treat. BCCDC proved exceptional in all three.

Testing - The BCCDC Public Health Laboratory developed a test within 10 days of genomic information being released—before BC had a single case. Alternative collection methods were also developed, such as gargle.

Trace - BCCDC supplemented traditional epidemiological tracing efforts by genomically fingerprinting positive test samples. This improved understanding of outbreaks, identified new introductions, and transmission dynamics. Genomic sequencing proved invaluable in identifying variants of concern and guiding the public health response.

Treatment - While an effective treatment doesn't exist for COVID-19, prevention is the best medicine. BCCDC provided information on infection control methods (hand washing, masking) and led efforts to secure and distribute COVID vaccines.

2

Continued Focus on the Overdose Crisis in BC in the Context of COVID-19

Since the declaration of the COVID-19 public health emergency, the rate of overdose events and illicit drug toxicity deaths have increased and surpassed historic highs. While its COVID-19 work was ongoing, BCCDC maintained focus on other critical priorities including the overdose public health emergency. Researchers developed specific resources for harm reduction and overdose response in the context of COVID-19. BCCDC research also identified an emerging trend of more people smoking drugs instead of injecting them which resulted in funding from the BC Ministry of Mental Health and Addictions for inhalation overdose prevention services, provision of smoking supplies for clients, and additional research funding to support the needs of people who smoke drugs.

3

BCCDC Awarded a CIHR Indigenous COVID-19 Grant to Develop Trustworthy and Culturally Meaningful Public Health Guidance to Address COVID-19 in Indigenous Communities

In BC, the COVID-19 pandemic has been characterized by a misinformation 'infodemic'. BCCDC's research into COVID-19 misinformation and stigma led BCCDC and Indigenous partners to develop a number of resources specifically for Indigenous people in this province. BCCDC was also awarded a CIHR Indigenous COVID-19 grant to develop trustworthy and culturally meaningful public health guidance to address COVID-19 in Indigenous communities. The grant was led by an Indigenous research team with support from non-Indigenous research partners signaling a change in culture that has historically locked out Indigenous communities from research opportunities. Furthermore, First National Health Authority (FNHA) was the first health authority to be able to document community level impact of COVID-19 vaccine as a result of a province-wide focus on equitable vaccine access.

TABLE 4 BCCDC Outcomes

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>Researchers from the BCCDC Public Health Lab along with collaborators in the Provincial Lab Medicine Services and BC Children’s Hospital developed the COVID-19 gargle test as an alternative to nasopharyngeal sample collection. This new mouth rinse and gargle sample collection was initially rolled out to BC collection centres for school-aged children, a first in Canada.</p>	<p>The gargle test enabled school-aged children to swish and spit to obtain their sample, making collection more comfortable for them, reducing pressure on the nose swab supply chain, and ultimately, making testing students easier when they returned to in-person classrooms.</p>	<p>Patient: Access to new treatment/ technology</p> <p>System: Efficiency, cost/benefits or sustainability</p> <p> BCCH, PMLS </p>
<p>Researchers from the BCCDC Public Health Lab obtained over \$4.5M in research funding to sequence the COVID-19 virus early in the pandemic. Sequencing was initially conducted for research purposes, but it quickly evolved into a routine public health service as the research team provided important data to support policy decisions. For example, in the early days of the pandemic, sequencing demonstrated the virus in British Columbia was coming primarily from the United States and Europe. This data assisted decision-makers in closing the borders. This leading-edge science is now being used to investigate possible COVID-19 re-infections, track variants of concern and monitor vaccine effectiveness.</p>	<p>Genomic sequencing work has informed key decisions around restrictions and other public health measures which has resulted in reducing hospitalizations and ICU admissions and preventing deaths due to COVID-19.</p>	<p>Patient: Delay of disease progression/ survival</p> <p>System: Knowledge dissemination-new policy</p> <p></p>
<p>BCCDC researchers along provincial partners collaborated to create the BC COVID-19 Cohort (BCC19C). BCC19C is a surveillance platform that integrates provincial COVID-19 data (laboratory testing, case surveillance data, hospital and intensive care unit admissions, and vaccinations) with administrative data holdings for the BC population (medical visits, prescription medication dispensations, emergency department visits, hospital admissions, laboratory tests, among others). BCC19C enabled daily updates regarding COVID-19 data, as well as weekly/monthly administrative dataset updates.</p>	<p>This platform was leveraged to investigate different aspects of COVID-19, including risk factors for severe outcomes, vaccination effectiveness and safety, unintended consequences, socio-economic disparities, and the intersection between the COVID-19 and overdose epidemics. Results emerging from these analyses have informed the provincial response to COVID-19. For example, analyses of risk factors for COVID-19 hospitalization were used to identify higher-risk populations for vaccine prioritization.</p>	<p>Patient: Delay of disease progression/ survival</p> <p>System: Efficiency, cost/ benefits or sustainability</p> <p> BCCH, PHSA </p>
<p>As a member of the government of Canada Vaccine Task Force, a BCCDC researcher was centrally involved in formulating and implementing Canada’s COVID-19 vaccine strategy. The strategy was based on the quick realization that Canada had no domestic vaccine manufacturing capacity. The task force developed a diverse vaccine portfolio by selecting two commercially available vaccines among three vaccine technology platforms (protein, mRNA and adenoviral vectors). The government was advised to secure advanced purchase agreements with 6 companies.</p>	<p>This strategy was Canada’s best hedge to secure COVID-19 vaccines for its population without having a domestic manufacturer of vaccines. As Canada and BC are exiting the pandemic situation, this strategy is proving to be successful as Canada is one of the top countries with high COVID-19 vaccination rates.</p>	<p>System: Efficiency, cost/ benefits or sustainability</p> <p></p>

TABLE 4 BCCDC Outcomes (continued)




Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>BCCDC researchers utilized various cohort and screening methods, applied to available surveillance databases, to rapidly assess impact of a single dose of mRNA vaccine in the earliest prioritized groups. By re-analyzing publicly available data from a randomized controlled trial, the research team found that one dose of the mRNA vaccine was over 90% protective after a two week wait period. To further check these findings, the team used real-world surveillance data from long-term care facility residents and health care workers that also showed substantial protection from a single dose.</p>	<p>The research team presented its analyses broadly, including to provincial and national committees, and was instrumental in the National Advisory Committee on Immunization’s decision to recommend extending the interval between doses.</p>	<p>System: Knowledge dissemination-new policy</p> 
<p>Researchers from BCCDC and the BCCDC Public Health Lab rapidly adapted its protocols for emerging respiratory pathogen sero-prevalence assessment to conduct the first series of blood analysis for SARS-CoV-2 antibodies using anonymized samples from LifeLabs. The results demonstrated that less than 1% of British Columbians had been infected with the COVID-19 virus by the end of spring 2020.</p>	<p>Findings highlighted substantial residual susceptibility indicating the need for maintenance of public health measures to control transmission. This work helped public health officials validate their public health measures and suppress COVID-19 through the winter and spring 2020 period which resulted in reducing hospitalizations and ICU admissions and preventing deaths due to COVID-19.</p>	<p>Patient: Delay of disease progression/ survival</p> <p>System: Knowledge dissemination-new policy</p> 
<p>BCCDC-affiliated researchers used data from the SmartSexResource - a real-time chat service monitored by BCCDC nurses - to determine how users’ expressed their mental health concerns, and the nurses’ responses to them. The team found that anxiety about sexual health was common among chat users.</p> <p>As a result of findings, researchers developed two resources:</p> <ol style="list-style-type: none"> 1) MindMapBC, an online database of mental health resources for clients accessing sexual health services. 2) Supporting and addressing anxiety in sexual health care: A resource for providers was developed in concert with sexual health professionals. 	<p>Mental health concerns are common for people accessing sexual health services. However, many clients do not have access to mental health care. MindMapBC reduces barriers by connecting clients with low-cost and accessible mental health supports, all of which accept self-referrals, and many of which are LGBTQ2+-affirming. Supporting and addressing anxiety in sexual health care: A resource for providers offers service providers information about sexual health-related anxiety as well as effective strategies to address it.</p>	<p>Patient: Improvements in timely access to care</p> <p>Patient: Protocols and guidelines</p> 
<p>In early 2020, when cases of COVID-19 began to spike in B.C., peer workers at overdose sites needed support and guidance to continue to do their jobs safely and effectively. The experiential researchers involved in Peer-2-Peer project sprang into action, creating COVID-19 resources specifically designed for peer workers and others with lived and living experience, including a guide for responding to overdoses during COVID-19, a video series on overdose response and safe disposal of PPE, and a COVID-19 support guide for vulnerable individuals. These resources were in addition to other COVID-19 resources created by BCCDC Harm Reduction Services including the BCCDC COVID-19: Harm Reduction and Overdose Response guide, best practices for outreach teams and a guideline for using overdose prevention sites during COVID-19.</p>	<p>These guidelines and resources addressed the compounded risks of COVID-19 and overdose for people who use substances and allowed peer workers at overdose sites and outreach teams to perform their jobs safely and effectively.</p>	<p>Patient: Protocols and guidelines</p> 

TABLE 4 BCCDC Outcomes (continued)

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>In May 2020, BCCDC researchers released the COVID-19 SPEAK Survey, a population health survey that gathered pandemic-related experiences of British Columbians. The survey was a tremendous success, garnering almost 400,000 responses. Results indicated that young people were most likely to lose their job, while households with young children reported extreme stress, sleeping less, and consuming more alcohol. Parents also said their children experienced impaired learning and worsening mental health. People from some visible minority backgrounds also experienced disproportionate adverse effects.</p>	<p>The survey results helped inform provincial public health measures, including whether to return to in-school learning. A second round of the survey, released spring 2021, received 200,000 responses, and results from both rounds are available on a virtual dashboard.</p>	<p>System: Knowledge dissemination-new policy</p> 
<p>BCCDC researchers along with colleagues at BC Children’s Hospital and Office of the Provincial health Officer created rapid evidence review on the Impact of School Closures on Learning, Child and Family Well-Being During the COVID-19 Pandemic. The goal of this work was to assess the benefits of suspending in-class learning on reducing COVID transmission and the known harms from prolonged absences from school on the well-being of children, youth, and their families.</p>	<p>The results of this work were used to inform decision makers on whether to reinstitute in-class learning for the 2020/21 school year.</p>	<p>System: Knowledge dissemination-new policy</p>  BCCCH 
<p>Post COVID-19 recovery clinic network protocols.</p>	<p>Improved post-COVID care around British Columbia and informing post-COVID care globally.</p>	<p>Patient: Protocols and guidelines</p>  BC Renal 
<p>The British Columbia Harm Reduction Client Survey (HRCS) is a survey completed by adult clients at harm reduction supply distribution sites across the province and collects information about drug use, perceived stigma, and accessibility of harm reduction services. The HRCS results identified that more people are smoking drugs than injecting them, which led to the BC Ministry of Mental Health and Addictions providing funding support for safer smoking supplies such as pipes and foils and inhalation overdose prevention services. Further, the HRCS noted many clients were unaware of the Good Samaritan Drug Overdose Act, resulting in implementation of KT initiatives with people who use drugs.</p>	<p>Data from the survey is used to inform harm reduction planning, confirm emerging issues, and to evaluate and improve quality of harm reduction services. Providing safer inhalation equipment reduces harms and ensures the health and safety of people using them.</p>	<p>Patient: Delay of disease progression/ survival</p>
<p>The issue of when, where and what types of masks should be worn, and by whom, to reduce the spread of COVID-19 has been a constant topic of debate throughout the pandemic with workplaces, public health authorities, community groups and members of the public seeking advice on the effectiveness of masks for reducing the transmission of the virus. By conducting a rapid literature of the effectiveness of masks in reducing SARS-CoV-2 transmission, researchers from the BCCDC and NCCEH developed web-based guidelines and key resources for the public, and public health professionals on masking. http://www.bccdc.ca/health-info/diseases-conditions/covid-19/prevention-risks/masks</p>	<p>Researchers and staff were invited to brief public agencies on their findings, while also advising community groups like schools and sports clubs. Members of the public were able to make personal decisions on what type of masks to wear by accessing the web-based resources. These guidelines also influenced our ability to assist other agencies developing practice and policy on mask use during the pandemic.</p>	<p>System: Knowledge dissemination-new policy</p> 

TABLE 4 BCCDC Outcomes (continued)

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>Researchers at BCCDC as well as BC Children’s hospital linked a recent decrease in incidences of childhood asthma with a reduction in antibiotic prescriptions. Asthma incidences in children had decreased 26% between 2000 and 2014 as a result of more prudent antibiotic prescribing in infancy. And with every 10% increase in antibiotic prescribing, asthma rates increased 24%. The team also found that the more courses of antibiotics an infant was prescribed, the higher the likelihood they would be diagnosed with asthma by age five.</p>	<p>The research team is now developing a business case for community antibiotic stewardship, which will demonstrate that if a jurisdiction reduces antibiotic use in infants by a certain amount, it will not only reduce antibiotic-resistant infections, but also childhood asthma and allergy, along with their associated cost-savings.</p>	<p>Patient: Delay of disease progression/ survival</p> <p> BCCCH</p>
<p>In BC, the COVID-19 pandemic has been characterized by a misinformation ‘infodemic’. The research team surveyed 3,000 British Columbian residents - including sizable Indigenous, South Asian and Chinese populations - to understand their knowledge, attitudes and behaviours related to COVID-19 misinformation. This work showed that these communities experience a greater burden of COVID-19 stigma. To address this, the team released a COVID-19 Language Guide which recommends inclusive language for written and digital COVID-19 content, decreasing the misinformation spread about stigmatized populations and communities.</p>	<p>The COVID-19 Language Guide helped decrease the misinformation spread about stigmatized populations and communities. The work also resulted in the formation of the COVID-19 Indigenous Knowledge Translation Group, which developed resources to help help Indigenous communities learn about COVID-19 in an accessible way and the founding of an Indigenous-inclusive BCCDC podcast entitled, Klöshe Wä'-wä.</p>	<p>System: Knowledge dissemination-new policy</p> <p></p>
<p>World Health Organization consolidated guidelines on drug-resistant tuberculosis.</p>	<p>Until COVID-19, TB has been the leading cause of infectious disease death globally, and unfortunately, will be again in coming years. One of the major problems with TB globally is drug-resistant disease which has worse outcomes and results in ongoing global spread of this difficult to treat disease. Improved treatment of drug-resistant tuberculosis will result in improved treatment outcomes in people impacted by this disease and will ultimately reduce the spread of this infectious disease globally.</p>	<p>Patient: Protocols and guidelines</p>
<p>Researchers at the Public Health Laboratory at BCCDC developed a new one-step hepatitis C testing protocol that only requires a single blood test. BC now adopts this one-step hepatitis C testing at a provincial level. Before this one-step process, patients had to have two separate blood sample tests to be diagnosed with an active hepatitis C infection. The new test can be done on a single blood sample.</p>	<p>This new testing method enables hepatitis C testing to be overall more efficient and cost effective. Implemented at a provincial level, this new test cuts associated health care costs by an estimated \$1 million annually.</p>	<p>Patient: Access to new treatment/ technology</p> <p>System: Efficiency, cost/ benefits or sustainability</p>
<p>After a study out of the United States suggested that the influenza vaccine could potentially increase the risk of illness from coronavirus, researchers at BCCDC analyzed historical data from the Canadian Sentinel Practitioner Surveillance Network (SPSN) and found no evidence that the influenza vaccine increased one’s risk of coronavirus. Overall, it was found that the vaccine significantly reduced the risk of influenza illness by more than 40% and had no effect on other causes of respiratory illness including infections due to coronaviruses.</p>	<p>By correcting the issues in the U.S. analysis, the Canadian findings provided strong evidence against the speculation that the influenza vaccine may negatively affect COVID-19 risk and provided reassurance for BC public health officials to roll out this year’s influenza vaccination campaign.</p>	<p>Patient: Access to new treatment/ technology</p> <p>System: Knowledge dissemination-new policy</p> <p></p>

STUDENT EDUCATION METRICS

BC CENTRE FOR DISEASE CONTROL



BC Centre for Disease Control
An agency of the Provincial Health Services Authority

BUILD PRACTICE EDUCATION CAPACITY



5,058

STUDENT HOURS
in FY 20-21
2,791 in FY 19-20



13

TOTAL # OF STUDENTS*
in FY 20-21
13 in FY 19-20

*Excludes undergraduate and postgraduate medical students



\$84,300

cost of STUDENT SUPERVISION
in FY 20-21
\$33,463 in FY 19-20



13

Medical Doctor
Undergraduate Students
in FY 20-21
5 in FY 19-20



9

PRECEPTORS had an active
placement in FY 20-21
4 in FY 19-20



29

Postgraduate Medical
Education Residents
in FY 20-21
19 in FY 19-20

••• BUILD EFFECTIVE PARTNERSHIPS & COLLABORATION TO SUPPORT INNOVATION



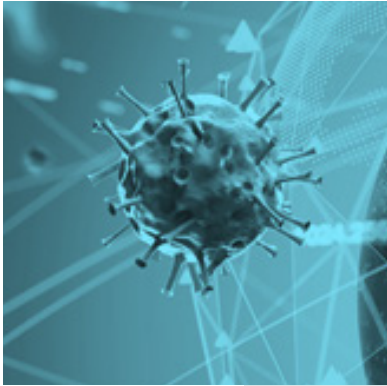
TOP EDUCATION INSTITUTIONS BY
PLACEMENT HOURS in FY 20–21

1. University of BC (2,210)
2. Simon Fraser University (2,048)
3. McMasters University (400)
4. University of Western Ontario (400)



4

of ACADEMIC PARTNERS
WITH AN ACTIVE PLACEMENT
in FY 20–21
5 in FY 19–20



WHRI / BC Women's Hospital & Health Centre

RESEARCH METRICS
STUDENT EDUCATION METRICS

RESEARCH METRICS

WOMEN'S HEALTH RESEARCH INSTITUTE

WOMEN'S HEALTH
RESEARCH INSTITUTE
AT BC WOMEN'S

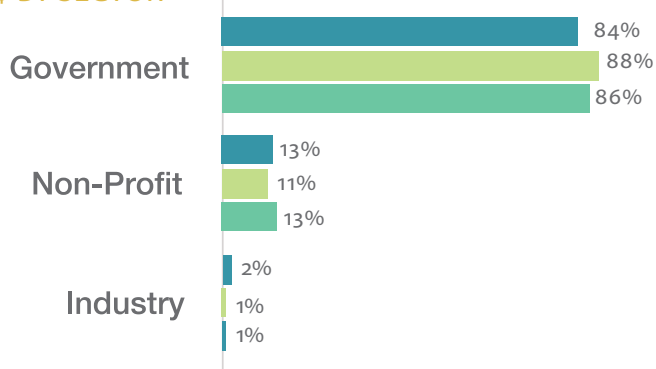


PRODUCING AND ADVANCING KNOWLEDGE

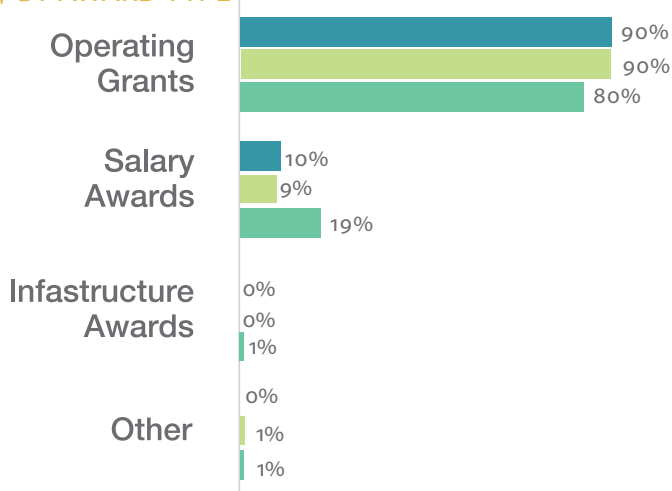
\$5.5 Million

in TOTAL GRANTS AWARDED in FY 20-21
\$5.9 Million in FY 19-20

\$ BY SECTOR



\$ BY AWARD TYPE



■ FY 20-21 ■ FY 19-20 ■ FY 18-19



950 TOTAL
OF PUBLICATIONS
in FY 20-21
744 in FY 19-20

407
JOURNAL ARTICLES
in FY 20-21
557 in FY 19-20

98%
PEER REVIEWED
in FY 20-21
97% in FY 19-20



100%
% of CIHR competitions
above National AVG
SUCCESS RATE
in FY 20-21
100% in FY 19-20

BUILDING RESEARCH CAPACITY

401

WHRI MEMBERSHIP
in FY 20-21
322 in FY 19-20



690

OF TRAINEES
in FY 20-21
736 in FY 19-20

\$ 155K

RESEARCH SUPPORT
FUND GRANTS
in FY 20-21
\$191K in FY 19-20

HEALTH & POLICY BENEFITS



23

OF CLINICAL TRIALS
in FY 20-21
53 in FY 19-20

1,938

TOTAL CUMULATIVE
SUBJECT ENROLLMENT
at the end of FY 20-21
3,521 at the end of FY 19-20



8%

% INDUSTRY FUNDED
TRIALS in FY 20-21
21% in FY 19-20

ECONOMIC BENEFITS & INNOVATION

No activity in FY 20-21

TOP 3 RESEARCH ACHIEVEMENTS WHRI



Details available in Supplementary Report

1

WHRI researcher leading the only national surveillance project of COVID-19 in pregnancy

A WHRI researcher is leading a Canadian Surveillance Project of COVID-19 in Pregnancy. This national project examines the epidemiology and outcomes associated with COVID-19 in pregnancy in order to provide critical data to inform recommendations for pregnant women and their infants. This project also lays the foundation for additional research through the creation of a biospecimen repository of COVID-19 affected mother-infant pairs. Interim findings from this project have shown that expectant mothers with COVID-19 have a greater risk of hospitalization, ICU admission, early labour and stillbirth. Data from this project is being used locally, nationally, and internationally to inform public policy and evidence-based guidelines for clinical care of pregnant women and their infants during this evolving global pandemic.

2

WHRI launches the COVID-19 RESPPONSE (Rapid Evidence Study of a Provincial Population Based Cohort for Gender and Sex)

The WHRI launched the COVID-19 RESPPONSE (Rapid Evidence Study of a Provincial Population Based Cohort for Gender and Sex) study to collect population-level data to determine the impact of COVID-19 and associated public health measures on British Columbians, grounded in a sex- and gender-based analysis. This study provides the first provincial estimates of COVID-19 infection and identifies COVID-19-specific impacts on communities of diverse sexes, genders, ages and locations. With over 6300 participants, the results of this study provide a better understanding of the sex- and gender-based impacts of pandemic management on existing inequalities in BC and Canada. These outcomes will inform future public health decisions including the development of social policies to better support vulnerable populations during future pandemics.

3

WHRI Opens Newly Constructed Skidmore Goodman Research Lab for Women's Health

The WHRI opened the newly constructed Skidmore Goodman Research Lab for Women's Health. Thanks to a \$2.5M donation from the Skidmore family via the BC Women's Health Foundation and a Canada Foundation for Innovation Grant, awarded to WHRI member Denise Pugash, a one-of-a-kind research facility has been built that encompasses the Perinatal Research IMaging Evaluation (PRIME) Centre and the Women's Health Research Wet Lab onsite at BC Women's Hospital. The PRIME Centre is an ultrasound imaging research facility (unique in Canada) dedicated to new imaging technology to benefit maternal and fetal health. In the first wet lab dedicated to women's research in the province, local investigators can now undertake cutting-edge biological research to better inform diagnostics, treatments, and health practices.

TABLE 5 WHRI Outcomes

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
Based directly on a series of research findings from a WHRI investigator and her team, in November 2020, the BC Government set a mandate for the provincial Minister of Health to ensure free prescription contraception for all British Columbians.	Improved outcomes for women and their families due to improved and equitable access to contraception particularly among vulnerable and marginalized women and families throughout the province.	Patient: Protocols and guidelines System: Knowledge dissemination-new policy
WHRI researcher was one of the lead authors of a national clinical practice guideline: Sonographic Cervical Length in Singleton Pregnancies: Techniques and Clinical Applications.	Improved maternal and fetal outcomes through the use of appropriate, evidence-based sonographic techniques resulting in the identification of women at risk of preterm birth and will lead to interventions that may reduce the rate of preterm birth, which is the leading cause of perinatal morbidity and mortality.	Patient: Protocols and guidelines System: Knowledge dissemination-new policy
WHRI researcher contributed to the creation of clinical decision aids for evaluating Vaccine-induced Thrombotic Thrombocytopenia (VITT).	Improved outcomes for people who develop rare but serious blood clots associated with the AstraZeneca COVID-19 vaccine through optimized identification and treatment.	Patient: Protocols and guidelines System: Knowledge dissemination-new policy 
Three WHRI researchers were co-authors of a national clinical consensus statement: COVID-19 Vaccination in Pregnancy.	Improved maternal and fetal outcomes through the evidence-based use of vaccination to prevent the COVID-19 transmission during pregnancy and breastfeeding given recent findings that pregnant persons are at increased risk of morbidity from COVID-19 infection. This guidance recommends that all available COVID-19 vaccines approved in Canada can be used during pregnancy and while breastfeeding if no contraindications exist.	Patient: Protocols and guidelines System: Knowledge dissemination-new policy 
WHRI researcher was the coauthor of a national clinical practice guideline: Management of Gestational Trophoblastic Diseases	Improved maternal outcomes for women who develop gestational trophoblastic diseases, which are rare tumours that occur inside the uterus (womb) during pregnancy, through prompt diagnosis of this condition and urgent referrals to gynaecologic oncology for specialized management.	Patient: Protocols and guidelines System: Knowledge dissemination-new policy
Three WHRI researchers were coauthors of a national Sexual Health And Reproductive Equity Committee Statement: Canadian Protocol for the Provision of Medical Abortion via Telemedicine	Improved outcomes for women through improved access to the provision of medical abortion settings where direct access to abortion providers may be difficult, particularly during the COVID-19 pandemic where access to in-person services is reduced.	Patient: Protocols and guidelines System: Knowledge dissemination-new policy 

TABLE 5 WHRI Outcomes (continued)








Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if icon appears.
<p>WHRI researcher was the coauthor of a national clinical practice guideline: Initial Investigation and Management of Adnexal Masses</p>	<p>Improved outcomes for ovarian cancer patients through optimized triage and referral to appropriate specialists for management and surgery. Ovarian cancer outcomes are improved when the initial surgery for adnexal masses is performed by a gynaecologic oncologist, likely as a result of complete surgical staging and optimal cytoreduction, thus, appropriate referral and management of the care of these patients is critical.</p>	<p>Patient: Protocols and guidelines</p> <p>System: Knowledge dissemination-new policy</p>
<p>WHRI/BCCHRI researcher was the coauthor of a national clinical practice guideline: Prevention, Screening, Diagnosis, and Pregnancy Management for Fetal Neural Tube Defects</p>	<p>Improved maternal and fetal outcomes through the use of appropriate, evidence-based guidance for the prevention, screening, diagnosis, and management of fetal neural tube defects. The recommendation that neural tube defect screening should be offered to all pregnant women will reduce the potential harms of an unexpected fetal diagnosis, subsequent management decisions and delayed access to care.</p>	<p>Patient: Protocols and guidelines</p> <p>System: Knowledge dissemination-new policy</p>
<p>Research findings from a WHRI researcher were incorporated into the latest edition the British Columbia Ministry of Health's childbirth handbook: Baby's Best Chance: Parents' Handbook of Pregnancy and Baby Care.</p>	<p>Improved maternal and infant outcomes due to the promotion of informed decision making for pregnant patients regarding options for birth after a previous caesarean delivery.</p>	<p>Patient: Protocols and guidelines</p> <p>System: Knowledge dissemination-new policy</p>
<p>Three WHRI researchers were coauthors of a national Sexual Health And Reproductive Equity Committee Statement: Induced Abortion: Updated Guidance during Pandemics and Periods of Social Disruption</p>	<p>Improved outcomes for women due to appropriate interim guidance to assure the availability of essential and time-sensitive abortion care in order to prevent unintended pregnancy during the COVID-19 pandemic or other periods of major social disruption such as natural disaster, wartime conflict, or significant supply-chain disruption.</p>	<p>Patient: Protocols and guidelines</p> <p>System: Knowledge dissemination-new policy</p> 
<p>WHRI researchers was the lead author of a national Infectious Disease Committee Statement: Corticosteroids in COVID-19</p>	<p>Improved maternal and fetal outcomes through the appropriate use of corticosteroids for antenatal lung maturation of the fetus during the COVID-19 pandemic.</p> <p>Based on the current evidence, and because definite harm to maternal health has not been demonstrated, the Society for Obstetricians and Gynaecologists of Canada (SOGC)'s Infectious Disease Committee recommends continuing with routine administration of antenatal corticosteroids up to 34+6 weeks of gestation.</p>	<p>Patient: Protocols and guidelines</p> <p>System: Knowledge dissemination-new policy</p> 

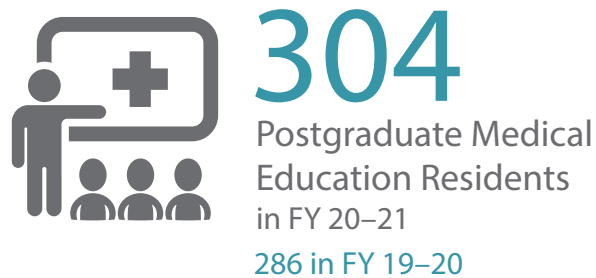
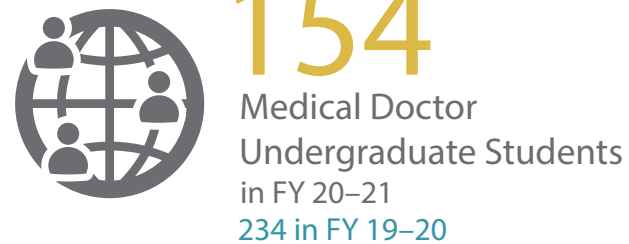
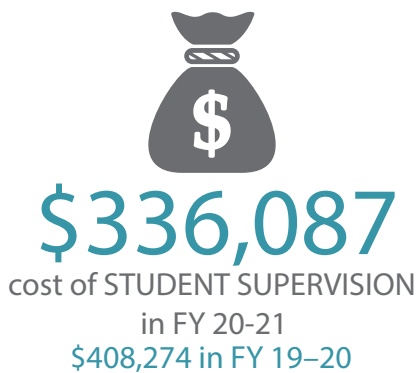
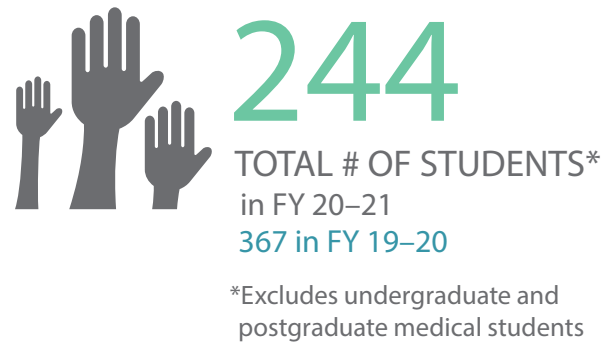
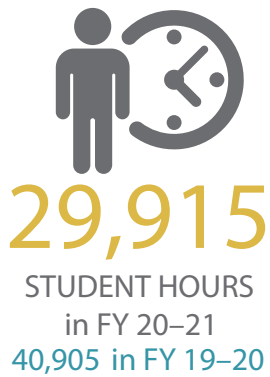
TABLE 5 WHRI Outcomes (continued)

Description of any guideline, drug, diagnostic agent, device or novel and transformational research design or methodology adopted or approved in FY 2020-21 as a result of research driven by PHSA researchers.	Please describe the benefits to patients, population health, and/or health system sustainability of the items identified.	Type of Benefit, Result of Internal Collaboration (if Yes ) , and COVID-19 Related if  appears.
<p>Three WHRI researchers were coauthors of a national Sexual Health And Reproductive Equity Committee Statement: Contraception Consensus: Updated Guidance during Pandemics and Periods of Social Disruption</p>	<p>Reduced risk to Canadian people and couples who want to avoid a pregnancy of lack of access to contraceptive care or methods through the use of interim guidance to affirm best practices and provide expert consensus on strategies to maintain contraceptive access during the COVID-19 pandemic or other periods of major social disruption.</p>	<p>Patient: Protocols and guidelines</p> <p>System: Knowledge dissemination-new policy</p> 
<p>Three WHRI researchers were co-authors of a national clinical committee statement: COVID-19 and Pregnancy</p>	<p>Improved maternal and fetal outcomes through the evidence-based care of pregnant persons during the COVID-19 pandemic. Given the evolving COVID-19 pandemic, the Society for Obstetricians and Gynaecologists of Canada (SOGC)'s Infectious Disease Committee created this committee opinion to help guide maternity care providers in the care of pregnant patients. This guidance is based on the evidence to date and continues to be updated as evidence emerges.</p>	<p>Patient: Protocols and guidelines</p> <p>System: Knowledge dissemination-new policy</p> 

STUDENT EDUCATION METRICS

BC WOMEN'S HOSPITAL & HEALTH CENTRE

BUILD PRACTICE EDUCATION CAPACITY



••• BUILD EFFECTIVE PARTNERSHIPS & COLLABORATION TO SUPPORT INNOVATION



TOP EDUCATION INSTITUTIONS BY
PLACEMENT HOURS in FY 20–21

1. BC Institute of Technology (15,252)
2. Kwantlen Polytechnic University (4,085)
3. University of BC (2,872)
4. Langara College (2,808)
5. Simon Fraser University (2,472)



9

of ACADEMIC PARTNERS
WITH AN ACTIVE PLACEMENT
in FY 20–21
10 in FY 19–20



BC Emergency Health Services

STUDENT EDUCATION METRICS

STUDENT EDUCATION METRICS **BCEHS** | BC Emergency Health Services

BC EMERGENCY HEALTH SERVICES

BUILD PRACTICE EDUCATION CAPACITY



34,653

STUDENT HOURS
in FY 20–21
58,586 in FY 19–20



249

TOTAL # OF STUDENTS
in FY 20–21
351 in FY 19–20



\$1.4 Million

cost of STUDENT SUPERVISION
in FY 20–21
\$2.3 Million in FY 19–20



155

PRECEPTORS had an active
placement in FY 20–21
139 in FY 19–20

BUILD EFFECTIVE PARTNERSHIPS & COLLABORATION TO SUPPORT INNOVATION



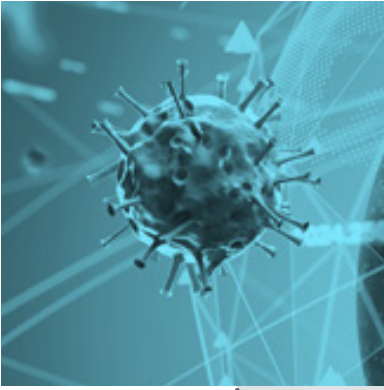
TOP EDUCATION INSTITUTIONS BY
PLACEMENT HOURS in FY 20–21

1. Justice Institute of BC (29,294)
2. CDI (2,532)
3. Academy of Emergency Training (1,660)
4. HeartSafe EMS (1,011)



5

of ACADEMIC PARTNERS
WITH AN ACTIVE PLACEMENT
in FY 20–21
3 in FY 19–20



PHSA Registries & Datasets

RESEARCH METRICS

RESEARCH METRICS

REGISTRIES & DATASETS

Registries are the result of significant infrastructure investment in the collection of longitudinal data that are regional, provincial or national in scope regarding provision of services to specific population(s), maintained for the purposes of undertaking analysis, surveillance and/or research.

REGISTRY/DATASET USES



87 %(13)
USED FOR RESEARCH

TOP 3

RESEARCH
SUPPORT
ACTIVITIES

1. Managing & Linking Data
2. Identifying Knowledge Gaps & Improvement Needs
3. Design of Research Studies



14 of 15

REGISTRY/DATASETS submit to Provincial, Federal or International datasets for purposed of research

REGISTRY/DATASET DESCRIBED



18
REGISTRIES &
DATASETS

representing



11
PHSA PROGRAMS

NATURE OF RESEARCH ACTIVITIES



208/193

DATA ACCESS requests/approvals in FY 20-21



8/13

registries ranked CLINICAL & HEALTH SERVICES RESEARCH as predominant types of research in FY 20-21

TABLE 6 These are examples of the types of research questions posed by investigators using data from PHSA registries and datasets in FY 20-21.

BCCH's Biobank	Enhanced Monitoring Implementation in Pediatric Kidney Transplant Recipients.
	Salivary Biomarkers in Childhood-Onset Obsessive Compulsive Disorder Study.
	SARS-CoV-2 Seroconversion in Asymptomatic Individuals.
	Metabolic Conditioning of Expanded Primary Human T Cells for Adoptive Cellular Therapy.
	The role of IgA1, IgA2 and their glycosylation in COVID-19 severity.
	Characterization and Regulation of Normal and Leukemic Stem Cells.
	Mechanistic understanding of the profound B cell defects in complete human CARD11 deficiency.
	Analysis of Antibody Neutralization Efficiency and Cellular Immunity in SARS-CoV-2-Positive Individuals Identified in At-Risk Individuals.
	Childhood Leukemia: transcriptomics-based point of care rapid diagnosis.
Mechanistic understanding of the profound T cell defects in IRF4 deficiency.	
BC Cardiac Registry	Coronary Artery Bypass Grafting: P2Y12 inhibitors and ACEI/ARBs to Corroborate Health outcomes (CABG-PATCH). We aim to determine whether use of these two classes of medications is associated with a reduction in death or major adverse cardiovascular events (MACE) in post-CABG surgery patients by analyzing data from large administrative databases containing demographic, clinical, and medication utilization information in British Columbia (BC).
	OBJECTIVES • To compare early and late clinical outcomes following transcatheter mitral ViV versus surgical redo MVR in non-matched or propensity-matched patients. • To determine risk factors for 30-day mortality and long-term survival following transcatheter mitral ViV or redo MVR
	Characterizing the Burden of Chronic Sternal Pain Following Cardiac Surgery.
	Long-term outcomes of chest pain patients who undergo cardiac CT angiography.
EPPIC	What are the predictors of high female sexual distress among people with endometriosis?
	1) To determine the prevalence of COVID-19, including asymptomatic infection, among an established cohort of British Columbia residents, stratified by age, sex, and gender 2) To determine the number of participants infected with SARSCoV-2 at the time of self-collection using saliva samples, stratified by age, sex, and gender.
	What proportion of women with hypercontracted pelvic floor currently use cannabis for pain, and what are their experiences with using cannabis?
	Are there identifiable factors that influence surgical outcomes in patients who undergo conservative surgery versus hysterectomy?
	Does in-patient follow-up after a telehealth consultation change the treatment plan?
	To measure the reduction in deep dyspareunia observed among people using the PLR with their partner. The investigators hypothesize that the PLR will be associated with a reduction in self-reported deep dyspareunia scores among participants randomized to the PLR intervention, compared to participants randomized to the waitlist control group. The measured reduction in deep dyspareunia will be used to power a future definitive trial. To assess the acceptability of the phallus length reducer (PLR) for participants with endometriosis and their partners. The investigators hypothesize that both partners will indicate the PLR is acceptable on the self-reported questionnaire. To explore whether an at-home assessment of dyspareunia is an acceptable and valid alternative to clinical measures. The investigators hypothesize that the at-home assessments of dyspareunia will be acceptable to participants and will yield results that are highly correlated with questionnaire-based and clinical assessments of this pain.
Breast Cancer Screening Database	What are the differences in cancer incidence and screening at the small geographic level?
	What are some of the gaps and challenges restarting the screening program after the pandemic related closure?
	Additional data required for a Prognostication model for breast cancer.

TABLE 6 Example Research Questions by Registry/Dataset (continued)

PROMIS-Renal	Incidence and prevalence of covid within CKD populations.
	Vaccination studies to determine impact of vaccination on CKD populations.
	Outcomes of people with IGA nephropathy in BC.
	Economic evaluation of kidney transplantation in CKD populations.
	Use of anticoagulation in dialysis and non dialysis patients with atrial fibrillation.
	Outcomes of CKD pts meeting criteria for SGLT2i studies: real world analysis of outcomes.
	PCKD pt outcomes in BC: Blood pressure and GFR trajectories.
PROMIS - Transplant Registry	What are the outcomes of patients with CKD* who have symptoms of COVID-19 requiring testing (with Nucleic Acid Test, (NAT)), and how do those outcomes differ by patient characteristics?
	Determine the prevalence and management of urethralstricture disease in renal transplant recipients and associated risk factors for their development?
	Compare molecular diagnoses to histology and clinical diagnoses. Record the relationship between Natera and MMDx readings and kidney function (GFR, proteinuria) and DSA.
	Investigate negative outcomes for at risk patients during the study period and develop a precision medicine approach to treating organ rejection in order to implement these findings into a national program to promote lifetime transplant survival.
	Compare CF lung transplant survival in Canada and the US.
	Identify the association between surgical complications and surgeon’s fatigue. (Tired surgeon)
	Determine the incidence and prevalence of diabetes in the lung transplant population.
	IMAGINE - The purpose of this research study is to investigate the effectiveness and safety of treatment with clazakizumab compared to a placebo (inactive substance) in kidney transplant recipients with CABMR. The study will test whether clazakizumab can slow or prevent the decline in the working of your transplanted kidney and lengthen the time before you will need to go back on dialysis or get a new kidney.
	BRIDGE Study - Qualitative Study to identify barriers to use current tools as expressed by indigenous ESKPD patients, prior living donor, and members of their communities.
	Can PREVENT AMR Program- This data will allow to investigate negative outcomes for at risk patients during the study period and aid in development of a precision medicine approach to treating organ rejection, with the final aim of implementing the findings in a national program to promote lifetime transplant survival.
BCCDC – COVID-19 Dataset	What is the impact of RMG on COVID-19 infection, non-fatal/ fatal overdose, all-cause mortality, and continuity of care for SUD and other concurrent health conditions?
	What is the impact of RMG on the uptake of public health measures to reduce the spread of COVID-19 and other behavioural and psychosocial outcomes?
	Determine individual-level risk factors for hospitality and mortality in people confirmed for COVID-19 in BC.
	Assess the long-term impacts of COVID-19 infection on health and healthcare utilization.
	Identify/explain if pre-existing health issues or risks have been exacerbated by COVID-19, or a direct result of COVID-19 measures or orders.

TABLE 6 Example Research Questions by Registry/Dataset (continued)

Tumour Tissue Repository	Assessing the oxygenation status of tumor-draining lymph nodes from breast cancer patients
	CDTS Machine Learning Digital Pathology
	B cell-mediated immunity in high-grade serous ovarian cancer
	Evaluating Carbonic Anhydrase IX and Cysteine Desulfurase, NFS1, Expression in Breast Cancer
	Resolving tumor and immune cell architecture in ovarian cancer using spatial transcriptomics.
	Role of intratumoral B-cells in breast cancer
	Metabolic tracing of tumour and T cells in the ascites of ovarian cancer patients
Perinatal Services BC	Improving maternal and perinatal health outcomes in high risk mothers, BC data: (Objective) 1. To compare BMI-specific rates of composite maternal mortality and severe maternal morbidity. Using mortality/morbidity among women with a normal BMI (18.5-24.9 kg/m ²) as a reference, excess mortality/morbidity rates will be quantified among women who are underweight (<18.5 kg/m ²), overweight (25-29.9 kg/m ²), and obese (>=30 kg/m ²). 2. To examine the age-specific rates of severe maternal morbidity among mothers with twins and triplets (as compared to mothers with singleton pregnancy); and to determine effects of multifetal pregnancy on the relationship between older maternal age and severe maternal morbidity.
	Developing a multi-source surveillance system for Fetal Alcohol Spectrum Disorder and prenatal alcohol exposure (SSFASD/PAE) in Canada: (Objective) This data request exists as part of a cross-jurisdictional effort to collect prevalence and incidence estimates on FASD and PAE in Canada. The data generated from PSBC will provide estimates of alcohol consumption during pregnancy in conjunction with use of other substances. By generating descriptive statistics of adverse neonatal outcomes known to be associated with prenatal alcohol exposure from this data, we can also generate an estimate of prevalence for youth that may be at-risk for a Fetal Alcohol Spectrum Disorder later in life (diagnosed as early as 2-3 years old). With stratification of the data, we can determine how this risk changes with intrauterine exposure to different substances.
	Risk of fetal death and optimal timing of delivery among overweight and obese women: (Objective) 1. To determine the association between pre-pregnancy BMI and gestational age-specific rates of stillbirth, neonatal death (within 28 days after birth), and serious neonatal morbidity in Canada. 2. To determine the optimal timing of delivery for overweight and obese (class I, II, and III) women at term gestation (addressing modification of risk by advanced maternal age, assisted conception, hypertension, and diabetes).
	Comparison of perinatal outcomes of planned home birth after cesarean (HBAC) and planned hospital vaginal birth after cesarean in British Columbia: The aim of this BC-based cohort study is to examine temporal trends in HBAC and to compare perinatal outcomes of planned HBAC and planned hospital VBAC. Our specific research questions are: 1. What are the temporal trends in HBAC and VBAC in BC. 2. Are maternal characteristics, mode of delivery and perinatal outcomes different between planned HBAC compared to planned hospital VBAC (midwife as primary care provider) in BC? 3. Are maternal characteristics, mode of delivery and perinatal outcomes different between planned HBAC compared to planned hospital VBAC (family doctors/obstetricians as primary care provider) in BC? 4. Are maternal characteristics, mode of delivery and perinatal outcomes different between planned VBAC (midwife as primary care provider) compared to planned hospital VBAC (family doctors/obstetricians as primary care provider) in BC?
	Assessing Quality of Care on Treatment Outcomes attributed to Prescriber Networks: (Objective) 1. Define adequately the difference in quality of care between prescribers 2. Comparison of Quality Care of prescribers nested within sites and caring for common individuals 3. Determine the influence of prescriber characteristics on opioid use disorder (OUD) treatment outcomes.

TABLE 6 Example Research Questions by Registry/Dataset (continued)

<p>Perinatal Services BC (continued)</p>	<p>Retrospective analysis and algorithmic development of maternal and fetal biomarkers of adverse placental outcomes - Research Questions: 1. What detailed image features associated with placental anatomy can be detected through machine learning algorithms applied to placenta ultrasound images? 2. Can detected image features not visible by manual inspection be consistently correlated with patient outcome? 3. Can a machine learning algorithm automatically extract regions of a placental ultrasound image that are relevant for prenatal examination? 4. What are spatial and pixel-intensity characteristics of regions detected by machine learning analysis to be associated with abnormal placental texture? 5. Can a machine learning algorithm assess the risk of a patient developing certain conditions from a placental ultrasound image? 6. Can a machine learning algorithm predict risk of a patient as well as or better than manual analysis from a trained obstetrical expert?</p> <p>Assessing the Treatment Effect with a Multi-state Process: An Application to Opioid Use Disorder: (Objective) 1. Develop a comprehensive, rigorously defined set of health system performance measures including a cascade of care for persons with OUD and share information with key stakeholders to facilitate evidence-based decision making. 2. Execute supplemental analyses to further refine the performance measures and identify additional priorities for evaluation and public health intervention. 3. Using the performance measurement system and in consultation with local collaborators, identify feasible and actionable public health interventions to address deficits in health system performance in opioid use disorder.</p> <p>Incidence, Treatment Strategies and Prognosis of Cerebral Venous Thrombosis in British Columbia, Canada” (Objective) 1. Validate sensitivity and specificity of ICD 9/10 codes in identifying CVT from administrative data in British Columbia. 2. Use BC administrative data to estimate incidence of CVT, associated demographics and major risk factors (age, sex, peripartum status, malignancy status, use of hormonal contraceptives or hormone replacement), and prognosis (mortality, length of hospital stays, re-hospitalization related to intracranial bleeding, seizures and recurrent VTE). 3. Use BC Medical Services Plan data to assess interactions with the health care system in the 4 weeks prior to diagnosis to estimate delays in diagnosis of CVT. 4. Using BC PharmaNet prescription data to assess choice of anticoagulant and duration of therapy for CVT, and to explore differences in duration and choice of therapy by prescriber (specialty [e.g., neurologist, hematologist, internist], prescriber’s geographic location) and patient characteristics (e.g., age, sex, peripartum status, malignancy status). 5. Use BC PharmaNet prescription data to estimate proportion of patients requiring anti-seizure medications after CVT diagnosis and describe the choice of agent and duration of therapy. 6. Identify the resources used by CVT patients in their journey through hospital and post-discharge to better assess their care utilization and cost of care.</p>
<p>BCEHS Cardiac Arrest Registry</p>	<p>ECPR-ECMO: Study investigated the benefits of ECMO for refractory out-of-hospital cardiac arrest. Patients meeting inclusion criteria are transported to St Pauls Hospital for ECMO. Survival outcomes of those receiving ECMO are analyzed.</p> <p>PulsePoint: RCT investigating patient survival with the use of an app that alerts bystanders to a public cardiac arrest. Survival outcomes will be compared between those that had bystander CPR initiated by the app, and those who did not.</p> <p>Educate Trial: Study investigating patient survival and the recognition of agonal breathing in cardiac arrest. One year of retrospective data is collected, dispatchers are educated on the recognition of agonal breathing, followed by one year of prospective data collection in OHCA. Survival rates are compared pre and post intervention.</p> <p>Out-of-hospital cardiac arrest Care Process and Reasons for Withholding Resuscitation Efforts: Approximately half of all non-traumatic OHCA are deemed unfit for CPR and resuscitation. This study seeks to quantify the reasons and patient characteristics of untreated OHCA.</p> <p>Modelling increased recognition in unwitnessed cardiac arrest using wearable sensors: This study seeks to model the clinical and system level effects associated with the use of 911 connected technologies as a strategy to increase recognition and reporting of OHCA.</p>

TABLE 6 Example Research Questions by Registry/Dataset (continued)

BCEHS Paramedic System Evaluation and Research Database (PSERD)	Approximately half of all non-traumatic OHCA are deemed unfit for CPR by EHS. This study seeks to quantify the reasons and patient characteristics of untreated OHCA.
	There is a gap between ACP current intubation practice and international best-practice. The goal of this study is to reduce incidents of adverse effects to patients during airway management and OHCA.
	Investigation of best practices in bystander and professional rescuer interventions to increase survival from opioid-related CA.
	The pandemic has created changes to the epidemiology of individuals accessing healthcare services. This project seeks to compare paramedic system utilization since the start of the outbreak to the same period in 2019.
	The EDuCATE Trial. Improving the Care and Survival for Prehospital Sudden Cardiac Arrest Victims via Transformative Changes to 9-1-1 Ambulance Communication -Assisted CPR Instructions and the Development of Innovative Technology: A CANet-CanROC-Industry Partnership.
	RCT. PulsePoint Respond alerts users of the app to potential cases of sudden cardiac arrest within a short distance of the user’s location, the app alerts them to the call and gives them directions as well as to the location of the nearest registered AED.
	This study investigates the benefit of ECMO for refractory out-of-hospital-cardiac arrest.
	Examination of pre-hospital predictors of long-term outcomes among OHCA patients, including the association of increased duration of in-field resuscitation with long-term survival and to assess temporal trends in LTS and re-admission for comatose survivors of OHCA.
	A multi centre retrospective chart review designed to evaluate the potential impact of a prehospital blood transfusion program in an aeromedical settling in BC.
	Multi-center, randomized control trial evaluating the effectiveness of a low cumulative dose of epinephrine, compared to a standard cumulative dose in adults with OHCA due to V-Fib.
BC Cancer Registry	Examining the epidemiology, treatment, and survival in young-onset colorectal cancer (EXPLAIN-yCRC): We propose to combine our expertise in epidemiology, health services research, health economics, and cancer research to data rich resources in British Columbia to explain and inform the contemporary epidemiology, treatment, and outcomes, including survival and mortality, and healthcare utilization, and costs in yCRC, as compared to those with CRC. Using linked provincial health databases including a population-based cancer registry, our research questions and corresponding objectives (and where relevant, hypotheses), to be undertaken for individuals with yCRC and, in comparison, those with CRC are: 1. To address the first research question on whether the risk and burden of yCRC is increasing, our first objective is to assess temporal trends in the epidemiology of yCRC (as compared to CRC) to address the hypotheses that the risk and burden of yCRC is increasing. 2. To address the second research question on how is yCRC being treated, our second objective is to delineate and compare patterns of treatment in yCRC and CRC to address the hypotheses that patient, contextual, and system factors influence treatment patterns in yCRC. 3. To address the third research question on what the outcomes of patients with yCRC are, our third objective is to evaluate patient outcomes in individuals with yCRC compared to those with CRC.
	Surgical Outcomes for GEP-NETs in British Columbia: A Retrospective Review: To validate prognostication models to help risk stratify patients with peritoneal mesothelioma and cancer of unknown primary. to use this data to help articulate a management strategy for these patients.
	Understanding the impact of relapsed lymphoid cancers: To investigate the pattern of resource utilization experienced by relapse lymphoma patients in current practice in BC.
	Focal Adjunct Study Protocol: 120-month Disease Detection: To inform optimal algorithms for cervical cancer screening.
	Patients with brain metastases in British Columbia: Comparing patterns of care and outcomes between 2012 and 2016.

TABLE 6 Example Research Questions by Registry/Dataset (continued)

<p>BC Cancer Registry (continued)</p>	<p>First Nations Cancer Research & Surveillance Project: This is a follow up analysis to the First Nations (FN) linkage project previously performed. That analysis identified increased incidence of cervix and colorectal cancer in FN, and poorer survival for most cancer sites in both men and women. The results from the previous project informed the development of the BC Indigenous Cancer Strategy. In addition to updating the previous analyses, this analysis will attempt to identify the causes of the previous findings, either lower participation in screening, later stage diagnosis, or worse stage specific survival. This information will provide additional information in the ways to reduce the cancer burden for First Nations people in British Columbia.</p>
	<p>Spatial Epidemiological Analysis of Cancer Incidence at a Small Geographic Area Level in British Columbia and Yukon: Using data from the BC and Yukon Cancer Registries, BC Cancer Mammography, Cervix and Colon Screening Databases, Canadian Census, Canadian Community Health Survey, Canadian Urban Environment (CANUE) Health Research Consortium datasets, this proposal aims to examine North-South gradients in cancer incidence at the small geographic area (SGA) level.</p>
	<p>Examining the frequency of radiographic tumor response assessment in the real world for patients receiving palliative first line chemotherapy for breast, colorectal, lung cancer: To determine the frequency of imaging in the real world for patients with metastatic breast, colorectal, lung cancers who receive first line palliative chemotherapy To compare the frequency of imaging to the frequency used for endpoint evaluation in the practice changing clinical trials for the respective tumor sites To evaluate the most common reasons for cessation of first line chemotherapy.</p>
	<p>Automated retrospective review of the effects of supportive cancer care interventions on quality of life and survival at BC Cancer: To characterize current access to supportive cancer care services for patients with supportive cancer care needs.</p>
	<p>Impact of 21-gene recurrence score assay on adjuvant systemic therapy selection in early-stage breast cancer: Is it cost-effectiveness age-dependent? Does the 21-gene RS assay result in a similar change in chemotherapy recommendation for women of all ages? Has this changed following the publication of the TAILORx trial results? In the post-TAILORx context, is the use of the 21-gene RS assay as currently funded by BC Cancer equally cost-effective for women of all age groups?</p>
<p>BC Trauma Registry</p>	<p>The use of clinical decision rules in evaluating blunt abdominal trauma in pediatric patients: A validation study: Researchers seek to conduct a chart review from the BC Trauma Registry database to perform a retrospective validation in their population of children exposed to BAT in British Columbia. A validated CDR will allow them to more systematically evaluate children following blunt trauma and ideally decrease their exposure to ionizing radiation through unnecessary CT scans. This would reduce costs and malignancy risk, improving outcomes over the long term. They also aim to collect data on transport times and transport distance for patients included in this study, which will allow them to gain a more holistic overview of the patients' interactions with the trauma system, viewing these in comparison to patient outcomes in the form of Injury Severity Score, morbidity, and mortality.</p>
	<p>Impact of trauma center accreditation on processes of care and clinical outcomes.: There is a growing trend towards accreditation of trauma centers in North America. However, the impact of accreditation remains unclear, due to several methodological shortcomings in the literature, such as the use of simple pre- and post-accreditation comparisons of outcome. Using population-based administrative datasets from Canada and the United States, we will assess how trauma center accreditation influences processes of care and patient outcomes over cycles of accreditation visits using an interrupted time series and difference-in-difference approach.</p>
	<p>Access to neurosurgical care and outcomes following severe traumatic brain injury in British Columbia: To evaluate the relationship between access to neurosurgical care and outcome following severe traumatic brain injury in British Columbia.</p>

TABLE 6 Example Research Questions by Registry/Dataset (continued)

<p>BC Trauma Registry (continued)</p>	<p>Canadian benchmarks for acute injury care: To produce Canadian benchmarks to monitor mortality, complications, hospital, and intensive care unit (ICU) length of stay (LOS) for acute injury that will be updated every three years thereafter. Benchmarking results can be used by local trauma committees to identify potential areas for quality improvement.</p>
	<p>Prediction of Massive Transfusion with the Revised Assessment of Bleeding and Transfusion (RABT) Score at Canadian Level I Trauma Centers : Trauma is an overlooked contributor of morbidity and mortality in the Canadian population and is the leading cause of death in people younger than 35. However, newer advanced resuscitation techniques such as institutional massive transfusion protocols (MTP) have been demonstrated to be efficacious in reducing trauma-related mortality, primarily by decreasing the risk of exsanguination and hemorrhagic shock. A massive transfusion can be defined as either greater than 10 units of pRBCs over 24 hours or greater than 3 units of pRBCs over 3 hours. Many scoring systems have been developed to attempt to predict the trauma patients who will require a massive transfusion protocol (MTP) activation. A newer score, the Revised Assessment of Bleeding and Trauma (RABT) score, has shown promise in validations studies as being more sensitive and specific than the most widely used scoring system at this time, the ABC score. However, the American trauma population is hypothesized to consist of a greater proportion of penetrating trauma, and therefore the validity of this score may not be generalizable to our trauma population in Canada. The purpose of this study is to perform a multi-center validation of the RABT score at two major Level 1 trauma academic centers in British Columbia.</p>
	<p>Mountain biking injuries in British Columbia: 1. To determine the types of injuries that occur secondary to mountain biking at Whistler compared to motorcycle collisions. 2. To determine if there are any significant demographic factors that may lead to increased risk of mountain bike injury. 3. To identify any areas of intervention or education that may lead to decreased injuries among mountain bikers at Whistler.</p>
	<p>Cardiac trauma carries high mortality rates and should be considered in all patients presenting with chest trauma. These patients can have a wide range of clinical presentations from being asymptomatic to being in hemodynamic collapse. Currently, multi-detector computed tomography (MDCT) is the gold-standard diagnostic imaging modality for all patients with abnormal ECG and/or Troponin I levels following chest trauma. In this review article, we discuss pathophysiology of cardiac trauma, review the role of medical imaging, and present the spectrum of abnormal findings in blunt or penetrating traumatic cardiac injuries.</p>
	<p>To identify all the intentional burn injury patients admitted to the Vancouver general hospital Burn Unit over a period of 10 years and compare them with a control group of accidental burn patients in mechanism of burn injury, psychiatric co-morbidities, social risk factors and different aspects of in-hospital care within the burn unit.</p>
	<p>Maybe Enough incompatible plasma Gives bad Outcomes: The study will investigate the outcome of transfusing minor-incompatible plasma, that is, capable of inducing hemolysis in the recipient, among trauma recipients and will include the plasma component of all transfused products and will include group O recipients.</p>
	<p>Radiation Burden in Trauma Patients at a Level I Trauma Centre: The primary purpose of this study is to describe the cumulative radiation exposure for patients admitted to trauma services at RCH; this will include any radiation exposure from the time of injury to 3 months post injury for the same individual. Furthermore, we aim to describe the cumulative radiation exposure by the body area affected by injury (e.g., head, chest, abdomen, etc). Knowledge of this will be helpful in focusing future efforts on minimizing repeat imaging studies on particular injuries that pose higher risk of radiation burden through other means, such as clinical decision tools or non-ionizing radiation imaging modalities.</p>

APPENDIX 1

RESEARCH METRICS WORKING GROUP MEMBERSHIP*

Ellen Chesney
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Research Services, BCCHR

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

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Karen Hagan
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Deborah Ross
Director, Research and Knowledge Exchange
BC Mental Health & Substance Use Services

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

*As of September, 2020

APPENDIX 2

FRAMEWORK FOR PHSA RESEARCH METRICS

1. Indicator: Producing and Advancing Knowledge

This category includes measures reflecting discoveries/new knowledge, and contributions to scientific literature.

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

2. Indicator: Building Research Capacity

This category includes measures reflecting enhancements to both human resource and infrastructure capacity.

- a. Total # trainees by agency/research entity
- b. Scholarships/fellowships by agency/research entity
- c. Total # researchers by agency/research entity
- d. Infrastructure investments
 - i. E.g. – hospital research fund, BCCHR, capital projects etc.
 - ii. Databases (patient, tissue) etc
- e. Research Support Fund grants

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

FRAMEWORK FOR PHSA

STUDENT EDUCATION METRICS

1. Indicator: Build Practice Education Capacity

This category includes measures that demonstrate level of commitment to students, preceptors, and post-secondary institutions as part of mandate to provide excellence in education and training.

- a. # of Students, Placement Hours by Discipline & Sub-Discipline
- b. # of Medical Students (Under-grads and Post-grads) by Specialty
- c. Estimated Cost of Staff Time by Encounter Type
- d. # of Confirmed Placement Requests by Month
- e. # of Confirmed and Declined Placements by Educational Institution for Priority Professions
- f. # of Declines by Reason (Most Frequent)
- g. # of Staff Participants in Preceptor/Educator Training
- h. # of Preceptors in HSPnet With and Without a Placement

2. Indicator: Build Effective Partnerships and Collaborations that Support Innovation

This category includes quantitative measures of PHSA's relationships with academic partners.

- a. # of Affiliation Agreements by Region and Sector
- b. Top % of Education Institutions by Student Hours
- c. Distribution of Student Hours by Practice Education Setting

3. Monitor the Quality of the Clinical Learning Environment and Results

This category includes measures for monitoring quality and outcomes.

- a. # of hires at PHSA with a previous placement
- b. # of Placements by Educational Institution for New Hires

APPENDIX 4

STUDENT EDUCATION COORDINATING COMMITTEE

Current Membership

Ellen Chesney ¹	Chief Administrative Officer – Research & Academic Services, Executive Sponsor
Annalies Becu ⁸	Co-Chair, Manager, Public Health
Christie Diamond ¹	Co-chair, Corporate Director - Academic Education
Karen Derry ^{4, 5, 6}	Associate Director, Inter-professional Practice
Justine Dodds ²	Director, Professional Practice, Burnaby Centre for Mental Health & Addictions
Sandra Harris ^{4,5,6}	Senior Leader - Clinical Education, Learning & Development
Andrea Knox ³	Director, Nursing & Allied Health Research & Knowledge Exchange
Yujin Lim ¹	Collaborative Practice Leader
Jennifer Molhoj ⁷	Manager, Clinical Education
Karen Mooder ⁹	Multi-site Director – Lower Mainland Pathology & Laboratory Medicine
Neeta Nagra ¹	Collaborative Practice Lead
Sarah Titcomb ¹	Administrative Coordinator - Academic Development
Christina Tsobanis ¹	Collaborative Practice Lead, Allied Health
Heena Vadgama ³	Education Coordinator
David Waller ⁴⁵	Director, Professional Practice
Sylvia Wu ⁴	Manager – Education, Dept. of Pediatrics

1. PHSA corporate services
2. BC Mental Health and Substance Use Services
3. BC Cancer Agency
4. BC Children's Hospital
5. BC Women's Hospital and Health Centre
6. Sunny Hill Health Centre for Children
7. BC Emergency Health Services
8. BC Centre for Disease Control
9. Lower Mainland Pathology and Laboratory Medicine

APPENDIX 5

COVID-19 FUNDING DETAIL

Funding Source Type/ Sponsor	Study Title	Award \$
BC Cancer Research Institute		
Infrastructure Awards		
Canada Foundation for Innovation	Preparing for the next wave: Technology to detect and analyze SARS-CoV-2	377,738
Operating Grants		
Canadian Partnership Against Cancer	Accelerating innovations to build resilience in cancer screening during COVID-19 and implementation of other initiatives	145,500
Michael Smith Foundation for Health Research	The impact of COVID-19 on cancer diagnosis and outcomes in British Columbia (BC)	140,920
NanoMedicines Innovation Network (NMIN) - Networks of Centres of Excellence (NCE)	Development of an aerosolized liposomal hydroxychloroquine for treating COVID-19 patients entering hospitals	45,000
	Development of an aerosolized liposomal hydroxychloroquine formulation treating COVID-19 patients entering hospitals	25,000
	Development of the Metaplex Immuno-Oncology Platform	24,719
	PharmaCore: Preclinical, scale-up manufacturing and project management core facility	28,719
University Health Network	The response of Provincial Health Systems to COVID-19; service provision and cost across health sectors, First Nations and other populations, and key tracer conditions in BC and Ontario	133,690
Salary Awards		
Innovation, Science and Economic Development Canada	Structural characterization and mechanism-based inhibition of TMPRSS2, a human protease that activates SARS-CoV-2	5,625
Province of British Columbia	Structural characterization and mechanism-based inhibition of TMPRSS2, a human protease that activates SARS-CoV-2	5,625
Structural Genomics Consortium	Structural characterization and mechanism-based inhibition of TMPRSS2, a human protease that activates SARS-CoV-2	3,750
BCCRI Total Funding		936,288
BC Centre for Disease Control		
Infrastructure Awards		
Canada Foundation for Innovation	Linking transmission metadata to viral genotype and serological response of COVID-19	761,697
Operating Grants		
AbCellera Biologics Inc.	Countermeasures for COVID-19 Pandemic	71,630
	Sequence SARS-CoV-2 Service and Extraction, Examination for Knowledge (S3EEK)	8,437
BC SUPPORT Unit	Accelerating SARS-CoV-2 Seroprevalence Surveys through Dried Blood Spots (COVID-19 ASSESS-DBS Study)	12,500
Canadian Institutes of Health Research (CIHR)	Evaluating the differential impact of what we have done, as we prioritize what to do next: a multi-provincial intervention modeling study using population-based data	276,000
	Rapid response to emerging serious pathogen outbreaks using Next-gen Data: R2E-SPOND	804,116
	Preventing Opioid Deaths due to COVID Related Increase in Smoking Illicit Substances (Preventing OD CRISIS)	200,000
	A rapid mixed methods evaluation of risk mitigation measures to address the dual public health crises of COVID-19 and overdose (ALTERNA-BC)	256,094

Funding Source Type/ Sponsor	Study Title	Award \$
Genome British Columbia	CanCOGen viral sequencing at BCCDC	938,133
	Securing Reagent Supplies and Scaling COVID-19 Testing in BC	62,500
	Characterizing Antibody Response to Emerging COVID-19 Virus (CARE COVID-19)	250,000
	One Health Genomics: COVID-19 Adaptation Investigation in Mink (and Spillover to Other Animals) COVID-19 AIM Project	250,000
	Prognostication of ACEII Receptor (PACEiiR)	147,000
Michael Smith Foundation for Health Research	Measuring the impact of physical distancing measures and creating paths for monitoring during the relaxation phase of the COVID-19 pandemic	149,910
	Population-based study of coronavirus antibody cross-reactivity to inform SARS-CoV2 seroprevalence surveys, severity profiles, and vaccine strategies	112,500
	Accelerating SARS-CoV-2 Seroprevalence Surveys through Dried Blood Spots (AS-SESS-DBS)	150,000
	Coronavirus Disease 2019 (COVID-19): serial anonymized sero surveys to assess population infections rates	6,435
	A mixed methods evaluation of risk mitigation measures to address the dual public health crises of COVID-19 and overdose (ALTERNA-BC)	75,000
Natural Sciences and Engineering Research Council of Canada (NSERC)	Expanding the wastewater-based epidemiology toolkit for monitoring COVID-19 community transmission in Canada	25,000
BCCDC Total Funding		4,556,951
BC Children's Hospital Research Institute		
Operating Grants		
AbCellera Biologics Inc.	Rapid Generation of COVID-19 Therapeutics from Pediatric Donors	39,830
Azrieli Foundation	Integrating brain imaging and rehabilitation to improve outcomes for children with co-occurring developmental coordination disorder & autism spectrum disorder	9,580
BC SUPPORT Unit	Cedar project: Preparing for culturally safe, trauma informed COVID-19 response among urban Indigenous people who use drugs in BC	15,000
British Columbia Centre for Disease Control	Secondary household attack rate evaluation of COVID-19 (SHARE-COVID)	181,122
British Columbia Children's Hospital Foundation	Using the MyHEARTSMAP tool during the COVID-19 pandemic to determine the impact on the psychosocial status of Canadian children and youth and inform mental health resources planning.	120,000
British Columbia Immunization Committee	The PREVENT-COVID Study: Prospective evaluation of immunity after COVID-19 vaccines	54,000
Canadian Institute for Advanced Research	A bio-ecological integrative approach to understand the hidden costs of COVID-19 on children	50,000
Genome British Columbia	Genetic Determinants of COVID-19: Integration of Host and Viral Genomic Data to Understand the COVID-19 Epidemiologic Triangle	168,716
International Development Research Centre	Household Transmission of SARS-Cov-2 in a Well-Characterized Kenyan Cohort	428,105
Kids Brain Health Network - Networks of Centres of Excellence (NCE)	Physical activity programs for children with neurodevelopmental disabilities and their families: Community partnerships to implement new physical activity coaching (New PAC)	40,000
NanoMedicines Innovation Network (NMIN) - Networks of Centres of Excellence (NCE)	Development and optimization of LNP-based gene therapy approaches in the brain	20,719
	Targeting the NLRP3 inflammasome with lipid nanoparticles for the treatment of type 2 diabetes	20,639
Public Health Agency of Canada	Tracking COVID to inform interventions and help make our schools safer	200,000
UBC School of Nursing	Exploring the experiences of NICU mothers during the COVID-19 pandemic	3,000

Funding Source Type/ Sponsor	Study Title	Award \$
Michael Smith Foundation for Health Research	Population-based study of coronavirus antibody cross-reactivity to inform SARS-CoV2 seroprevalence surveys, severity profiles, and vaccine strategies	37,500
	All-cause and cause-specific mortality and acute morbidity attributable to Covid-19 and medical history associated with severe Covid-19 infection in BC	43,000
	Coronavirus Disease 2019 (COVID-19): serial anonymized sero surveys to assess population infections rates	59,590
	COVID-19 in children and young adults in BC - Evaluation of public health measures and epidemiologic support for decision-makers	150,000
	The Cedar Project: Preparing for culturally safe, trauma informed COVID-19 response among urban Indigenous people who use drugs in BC	149,966
	Study of health outcomes in neonates exposed to COVID-19 in British Columbia (SHINE-BC)	40,000
Symvivo Corporation	A Phase 1, Randomized, Observer-Blind, Placebo-Controlled Trial to Evaluate the Safety, Tolerability, and Immunogenicity of the bacTRL-Spike Oral Candidate Vaccine for the Prevention of COVID-19 in Healthy Adults	20,225
UBC Peter Wall Institute for Advanced Studies	Swab to PCR: Simple and rapid diagnosis of COVID-19 using extraction-free nucleic acid amplification	19,624
Canadian Institutes of Health Research (CIHR)	Sociocultural and behavioural factors affecting communities' response to countermeasures for COVID-19 epidemic: Identifying interventions to build trust	40,000
	Understanding the effects of public health outbreak control policies and implementation on individuals and communities: A path to improving COVID-19 policy effectiveness	69,569
	All-cause and cause-specific acute morbidity attributable to Covid-19 epidemic, severe Covid-19 symptoms, and adverse birth outcomes in Canada	168,300
	Canadian treatments for COVID-19, in partnership with the WHO solidarity trial	10,000
	COVID-19 Variant Supplement - Canadian Treatments for COVID-19: SOLIDARITY	50,000
	COVID-19: Improving the evidence to treat an emerging infection through observational studies and a randomized trial	-99,108
	The unintended consequences of implementing stay-at-home policies during the COVID-19 pandemic: Violence outcomes in children and youth in Canada	178,500
	The Cedar Project: Preparing for culturally safe, trauma informed COVID-19 response among young Indigenous people who use drugs in Prince George and Vancouver, BC	549,258
	Rapid research in the CHILD cohort to inform Canada's response to the COVID-19 pandemic: Investigating the prevalence and predictors of SARS-CoV-2 infection, and the health and psychosocial impact of the COVID-19 crisis on Canadian families	100,000
Weston Family Foundation	Characterizing the Gut Microbiome in Patients during COVID-19 Infection	125,700
Other		
UBC Peter Wall Institute for Advanced Studies	Prudence, won't you come out to play? A virtual roundtable series on reopening programs for children outdoors during COVID-19	10,000
Salary Awards		
Bold Therapeutics, Inc.	Cellular inflammatory and anti-viral effects of BOLD-100, a novel therapeutic agent in development for COVID-19	22,500
Innovation, Science and Economic Development Canada	Application of multi-omics and pharmacological studies to discover potential new therapeutics for COVID-19	16,875
	Cellular inflammatory and anti-viral effects of BOLD-100, a novel therapeutic agent in development for COVID-19	11,250
PROOF Centre of Excellence	Application of multi-omics and pharmacological studies to discover potential new therapeutics for COVID-19	11,250
Province of British Columbia	Application of multi-omics and pharmacological studies to discover potential new therapeutics for COVID-19	16,875
	Cellular inflammatory and anti-viral effects of BOLD-100, a novel therapeutic agent in development for COVID-19	11,250

Funding Source Type/ Sponsor	Study Title	Award \$
BCCHRI Total Funding		3,162,835
BC Mental Health and Substance Use Research Institute		
Operating Grants		
Canadian Institutes of Health Research (CIHR)	A national study of opportunities and obstacles to successful community reintegration of forensic patients	32,426
Women's Health Research Institute		
Operating Grants		
Canadian Institutes of Health Research (CIHR)	Canadian surveillance of COVID-19 in pregnancy: Epidemiology, maternal, and infant outcomes (CANCOVID-Preg)	825,367
Women's Health Research Institute	The Impact of COVID-19 on Births Following Spontaneous Conception and Assisted Reproduction in British Columbia: A Prospective Population-Based Study	25,000
WHRI Total Funding		850,367
Grand Total		9,538,865