**Canadian Health Services and
Policy Research Alliance**
Training Modernization Working Group

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Challenges, Opportunities, and Future Directions for Health Services and Policy Research Training in Canada: A White Paper

Report for the Working Group on Training
Final
May 19, 2015

Background

In March 2015, the first-ever pan-Canadian vision and strategy for health services and policy research (HSPR) was released as a collaborative initiative among the Institute of Health Services and Policy Research (CIHR-IHSPR), provincial health research funding organizations, and many of Canada's health charities. This Vision and Strategy sets the stage for a number of joint initiatives to position Canada as global leader in health services and policy research that optimizes health and health system outcomes. One of the key outcomes of the Strategy has been the establishment of an Alliance for HSPR in which funders, researchers, health system organizations and stakeholders may collaborate on specific initiatives where shared goals and potential outcomes exist.

One key area for pan-Canadian collaboration is the training and development of HSPR capacity to improve health system performance. Canada has traditionally been viewed internationally as a leader in health services and policy research, possessing many of the necessary ingredients to develop and test innovative approaches. Developing and sustaining strong training and education capacity that meets the evolving needs of the market is essential for this success to continue.

> "Health policy and services research in Canada is leading internationally on so many fronts and needs to continue to demonstrate that leadership in the training and development domain by broadening our skills and approach"
> ~ Consultation Informant

Never before has the value proposition for doctoral-level health services and policy research been clearer – governments and health system organizations need answers to complex questions related to the development of policy and design and delivery of services and these answers need to be based on a comprehensive grasp and a sophisticated interpretation of the available evidence. Clearly, the potential for HSPR researchers, especially those trained at the doctoral and postdoctoral levels, to contribute to health system reform and improvement is very high. However, traditional pathways for them outside of academia are not always clear and the skills of doctoral graduates may not always be optimally suited to the demands of the health ecosystem.

The context for the subsequent analysis is as follows:

- Higher education is undergoing major transformation at all levels.

- Universities are facing increasing financial constraints and, for that reason and others, are moving to reconsider the role of tenured professorships in the composition of their teaching complements.
- The funding for health services and policy research is changing in a variety of ways with reform of the Open Grants Program at CIHR and new approaches to peer review.
- Health policy agencies and health service provider organizations are facing unprecedented challenges involving fiscal sustainability, aging and increasingly engaged patient consumers, and new and evolving health technologies. Dealing with all these challenges will increasingly require the ability to generate evidence and use it effectively.
- CIHR's Strategy for Patient Oriented Research (SPOR) Networks are developing and present an ideal opportunity and vehicle for fostering new partnerships between research, policy and practice to create dynamic and responsive learning networks. These partnerships ought to be generating demand for doctoral graduates on both the academic and the non-academic sides.
- CIHR more broadly is undertaking an assessment of health research capacity development, observing similar trends and opportunities across all four pillars of health research and is advancing a collaborative approach to health research training plans. Our work seeks to align itself with the broader initiative with a specific focus on health services and policy research.

Purpose and Methodology

This paper is a summary of the analysis undertaken as part of the development of the Canadian Health Services and Policy Research Alliance Training Working Group (see Appendix A for Terms of Reference). This analysis consisted of a comprehensive review and synthesis of the literature related to the development of PhD training capacity in health services and policy research in Canada and internationally as well as of the literature on the development of doctoral-level training in general (see Appendix B). In addition, a series of consultations was undertaken with representatives of the training and student communities as well as with employer groups who were able to articulate the specific challenges and opportunities associated with the competencies and skills of doctoral-level health services and policy researchers (see Appendix C for list of consultations).

This paper presents a summary of the context and challenges facing health services and policy research education and training as well as a number of possible opportunities and strategies for collaboration for the Alliance going forward as well as criteria for assessing and evaluating options. This paper is intended as a discussion document for a pan-Canadian working group that will be comprised of training experts, health system leaders and employers who are interested in developing and advancing a collaborative agenda. It is expected that the criteria for evaluating options and the options themselves will form the basis of discussion as part of the inaugural Alliance meeting in Montreal on May 24, 2015. This paper and any associated work following the May meeting will seek to align itself with the broader work that is part of CIHR's Strategic Road Map which includes an assessment of health research capacity development and the design of a collaborative approach to health research training plans.

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Evolution of HSPR Training in Canada

The health services and policy research field has grown significantly over the past 15 years, marked by the introduction of new training programs across Canada, the growth of the Institute for Health Services and Policy Research within the Canadian Institute for Health Research, and the establishment of the National Alliance of Provincial Health Research Organizations (NAPHRO). The Canadian Health Services Research Foundation (now the Canadian Foundation for Healthcare Improvement) also features prominently in the evolution of the health services and policy research in Canada. Through a series of programs, these organizations and their partners built HSPR training capacity and sought to foster partnerships between researchers and health services and policy decision makers that are critical to realizing the impact of research activity.

> "We need to carefully consider if we are building the supply and capacity that fits the market need or the labour market reality"
> ~ Consultation Informant

Over this period, nearly $770 million was invested in building capacity for health services and policy research, and a number of programs were established or expanded within a variety of departments across Canada[1]. Some of the discipline is housed within schools, faculties or departments of public health, health sciences, or medicine, while others are housed in departments of epidemiology, economics, etc. There is also a series of specialized centres across the country dedicated to the training and advancement of health services and policy researchers.

Of this total funding, training awards were allocated 5.7%, with doctoral awards and fellowships accounting for the biggest part of this investment[1]. A combined total of 1,488 applications for CIHR Fellowship Awards and CIHR Doctoral Research Awards were received within a 10-year period starting in 2001. In 2007, Academy Health identified 124 HSR programs in the US and Canada producing approximately 300 doctoral graduates a year.[2] While no detailed data exist, the number of academic jobs that have emerged over the same period is certainly considerably smaller.

According the data that are available, health service and policy graduates have performed relatively well compared to those of other pillars. A large number of applicants to the Health Services and Policy pillar apply for a grant within the first few years after receiving their post-doctoral degree (irrespective of whether

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or not they received a post-doctoral fellowship). Near the end of a 10-year follow-up, however, a greater proportion of funded post-doctoral fellows from the Clinical pillar applied for a grant (see Appendix D)[3].

A number of programs have supported this development, including:

1. Capacity of Applied Developmental Research and Evaluation in Health Services and Nursing (CADRE), a program launched in 2000 for an initial funding period of 10 years. This collaboration between CIHR and CHSRF/CFHI was established to address several objectives, including the development of the HSPR community on a master's and doctoral level and the utilization of research evidence in Canadian healthcare organisations. Investments were made in the form of postdoctoral awards, mid-career chairs, regional training centres and career reorientation awards[4]. In the course of the CADRE initiative, a total of 83 postdoctoral awards, 12 mid-career chairs and 13 career reorientation awards was allocated in addition to the creation of the Regional Training Centres[4]. An evaluation of the program showed that a significantly higher percentage of individuals involved in the CADRE program were able to secure positions related to applied health services and nursing research than those who were not (90% vs. 69%) and that the CADRE initiative helped to improve the availability of research positions outside of academia[5].

2. Regional Training Centres (RTC): The development of four regional and one national training centre originated within the CADRE program and marked a milestone in the capacity-building process of HSPR in Canada. An essential component of these training centres was mandatory student placements within health care organizations designed to bring researchers and decision makers closer together[6,7].

3. Strategic Training Initiative in Health Research (STIHR): This initiative was introduced by CIHR to support researchers through the funding of specific training programs. Between its launch in 2001 and 2009, 140 programs were funded, including 36 renewals. [8,9].

Other programs focused on public health training have also evolved with a doctoral level focus. However, the ability to sustain these programs and maintain their relevance to the changing labour market is one of a number of challenges faced by HSPR training and education initiatives.

Challenges: Education and Training of Health Services and Policy Researchers

The following section outlines the key challenges confronting the training and education of health services and policy researchers at the doctoral level. The nature and impact of each of these is an important discussion item for the May meeting of the Alliance

1. Tracking and Measurement

While we know that our production of HSPR graduates has increased, we know very little about the actual paths these individuals have taken, nor do we have appropriate criteria against which to evaluate the education they are being given.

Most Canadian HSPR training programs currently have no tracking system in place to follow the career paths of their graduates. This gap is highlighted by a recent study that demonstrated that out of 15 Canadian universities providing HSPR training, as many as 80% did not track where students went after the completion of their degree and only 13.3% pursued ongoing follow-up. Regional Training Centres and the STIHR program presented an exception, with all of them reporting that they followed up with their graduates at least once[10].

> "Significant investments have been made to increase HSPR capacity in Canada and around the world but no systematic attempts to evaluate the impact of these investments have been made. As a research community, we have the expertise and responsibility to evaluate our health research human resources and should strive to build a stronger knowledge base to inform future investment in HSPR research capacity"~ Grudniewicz et al. Health Capacity development in health systems and policy research: a survey of the Canadian context 2014

As part of the development of the Alliance, PhD training programs in health services and policy research were asked to participate in a survey that confirmed the lack of mechanisms in place to track and measure the success of their graduates. Although many informants confirmed that they do not have a formal mechanism in place to track their graduates' careers, they did voice an interest in addressing this gap. A recent survey of 169 organizations revealed that only 40% of the respondents were tracking their students after graduation. The quality of the systems in place varied hugely and included alumni surveys, social media groups and informal relationships[11].

2. Skills Training/ Retraining

The lack of tracking following graduation shines a light on another issue-- the lack of alignment of the goals of our training programs with the needs and realities of the post-graduation job market.

While PhDs are arguably better prepared now than ever before, the relatively small job market for academic positions and the changing expectations of the non-academic labour market suggests that there is an urgent need to rethink the way that PhD graduates are being educated and prepared. Universities have the responsibility to equip future health services and policy graduates with skills

> "Quite frankly, our experiences with PhDs in HSPR have not been great. They know a lot about a little and have a hard time working laterally and within the health policy or health services space where their research applies"
>
> ~ Employer Informant

and knowledge that will allow them to contribute to the goals of both private and public employers. It is also important for universities and employers two spheres to better understand each other and the imperatives of their work environment in order to enhance collaboration and the ability for people to move between the Academy and health system organizations.

Although programs differ, training in all of them is largely focused on the development of a series of core competencies that have been designed to benefit the doctoral student in an academic career. The educational curriculum for PhD graduates in HSPR concentrates on deepening knowledge of the Canadian health system, evaluative sciences, health policy, health economics and health services management. These competencies are essential for an academic career, but may not be as appropriate – on their own – to the needs of the non-academic market. To achieve success in a non-academic environment students also need to develop skills in management, program evaluation, analysis of administrative data, writing short policy briefs, public presentation skills and teamwork. Additionally, while there has been a large increase in the number of HSPR graduates, a number of informants point to a shortage of graduate with health economics and policy evaluation skills.

The recently developed framework for core competencies of master's level students in HSPR identified attributes such as clear communication, critical thinking, problem solving and interdisciplinary work. By including the

preferences of students, alumni and employers in the development of this framework, it was possible to get a comprehensive picture of what is expected from these students[12]. The employers who were consulted placed special emphasis on responsiveness and clear communication. The desire for research that focuses on current issues in the non-academic market (e.g., the use of big data) was also mentioned. The feedback we received from employers indicates that these competencies are seen as lacking in doctoral students as well.

These perceptions among employers could be the result of bad experiences or the lack of communication with graduate programs. It appears that opportunities need to be created in which the importance of employing an HSPR doctorate graduate can be demonstrated to market leaders in a clear way. It is essential to think about how the focus of current health services and policy research training can be aligned with the needs of the market.

3. Career Paths

Non-academic career paths exist for PhDs in health service and policy research. However, they are not well known, well developed or well supported. This needs to change.

The employment situation for doctoral graduate students of all kinds in Canada has deteriorated over the last few decades. The proportion of full-time tenure and tenure-track positions in the faculty complements of Canadian universities declined by 10% from 1981 to 2007. The prospects for young academics are even worse: in 2006/2007, only 12% of full-time tenure-track positions were secured by individuals under the age of 35.[13] Despite this, the enrolment in Ontario doctoral programs nearly doubled between 1999 and 2009[14]. A majority of doctoral students from the class of 2005 reported in the 2007 National Graduates Survey that they were planning to pursue an academic career[13].

> "The Academy should look at priority areas and skill sets most aligned to non-academic career paths for PhD trainees. In the system we need people who can do sophisticated economic analyses and those who have advanced data skills to deal with our "big data" questions. Ideally these people have both the technical skills and understand the nuances and how to operate in the health system"
>
> ~ Employer Informant

Current health services and policy research PhD graduates face both a low chance of securing an academic position and barriers to finding non-academic employment. Non-academic organisations may prefer individuals with a master's degree over a doctorate for a variety of reasons including their age and flexibility. An additional challenge for PhD graduates working in managerial positions is the so-called "analysis paralysis". While thoroughness and careful analysis are key competencies within the academic community these can be a hindrance in the non-academic workplace, where quick decisions are often required. At the same time, the return on investment for a PhD in HSPR does not seem overwhelming. In fact, 27% of the graduates from the class of 2005 in Ontario claimed that they would not need a doctoral degree for their current position.[13]

In the light of the current opportunity mismatch for graduates, the program changes at CIHR, and the new opportunities presented by the SPOR networks, it is essential to offer innovative programs in policy-making and service delivery environments. However,

4. Program Sustainability

While many initiatives were launched over the last 15 years to support the development of health services and policy research, a multi-level program like the Capacity for Applied and Developmental Research and Evaluation in Health Services and Nursing (CADRE) appears especially important. This program, a co-initiative of CIHR and CHSRF/CFHI with annual funding of approximately $6.5 million, not only focused on the development of new capacity but also encouraged the collaboration between researchers and decision makers[7].

> "The golden age of HSPR may be over. We need to look at the next wave of development with a critical eye and begin with the end in mind. SPOR may be our chance to do this right."
>
> ~ Consultation Informant

One component of this 10-year funding initiative was the creation of four Regional and one National Training Centres. These centres were set up to pursue the common mission of growing the HSPR community on a master's and doctoral level and to increase access to and use of research evidence in the decision making world[7]. Each individual training centre was created as a multi-site establishment of at least two institutions. They had to fulfill some basic requirements that included knowledge transfer courses and structured engagement with decision makers[7]. This mandatory linkage between researchers and decision makers made the program valuable to both parties. It

presented an opportunity for researchers to explore the labour market and establish valuable connections and for decision makers to experience the value of research evidence first hand[7].

While this program was regarded as successful and welcomed by decision makers, it was not renewed at the end of its funding period[6]. The same can be said for other key programs such as Strategic Training Initiative in Health Research (STIHR) and the Partnership for Health Systems Improvement (PHSI). Despite largely positive evaluations, none have been effectively sustained even when they are demonstrated to be successful. Investments to build capacity need to have the end in mind and articulate and plan for sustainability and growth over time. Sustainability needs to be part of the plan for building capacity going forward.

Opportunities

While graduate education is changing, it may not be changing fast enough to meet evolving needs. Students are demanding training and education that promises a return on investment. The challenges faced by by our HSPR doctoral students are not unique to Canada. The proportion of people with doctorates in all fields who get tenured academic positions has been dropping in the USA and in Europe, and industry has not fully absorbed the slack.[15] Some universities are experimenting with PhD programs that better prepare graduate students for careers outside academia. Germany, as Europe's biggest producer of doctoral graduates, has been leading in this effort. It has been redesigning its doctoral programs over the past 20 years as a mechanism to better meet the needs of the market. This effort has resulted in doctoral degrees being marketed as advanced training for a wider workforce beyond academia.[15] The "Workshop PhD" concept presents another possibility for students to prepare for a non-academic career. Students are required to develop four linked projects and carry out a teaching assignment within 5 years.[16] This type of program contemplates a non-traditional dissertation, which may be better suited to preparing students for non-academic careers.

The literature and interviews with key informants point to several strategies to address vulnerabilities in the education system as well as to increase the potential for graduates to contribute directly to the health system. These options

should be considered in reference to a set of assessment criteria. The following outlines possible criteria for assessment and several options for consideration.

Criteria to Assess Options for Alliance

Criteria	Description
High Impact	• Should be able to have significant influence on increasing/improving the training capacity in Canada
Scalable	• Should be able to scale across the country and be relevant in all jurisdictions to some degree
Flexible	• Able to accommodate different streams of students (some focused on early attainment of leadership positions, some focused on analytical excellence)
Feasible	• Realistic cost model in light of economic context • No new ongoing money (only start-up costs) given the economy etc.
Conducive to collaboration model	• Value in impact or economies of scale if approached as a collective effort on a pan-Canadian basis.

The following are options to consider.

Possible Options for Consideration

High/ good	Medium/ Moderate	Low/ poor

Focus	Option	Rationale	Impact	Scale	Flex	Feas	Collab
Supply -Side	Develop Monitoring and Evaluation Infrastructure to track where graduates go and how skills are applied and valued following graduation	• Very difficult to assess issues and strategies without data. • Tracking could be part of continuation of asset map.	Medium	High	High	High	High
	Develop career development framework for HSPR. Identify, clarify and expand on non-academic career paths for PhD graduates	• Schools must provide appropriate training, mentoring, and information about career opportunities outside academia (business, government, non-profit sector) in addition to those in academia. • Consider adding HSPR key "cannons" or theories all PhDs should know (eg Evans Barer determinants of health)	Medium	High	High	High	High
	New competitive grants program or doctoral traineeship program	• Traditional approach	Medium	Medium	Medium	Medium	Medium
	Develop updated competency model for PhD programs – possibly based on "type" of student or phenome (eg leader/ researcher or highly analytic evaluator)	• Trainees need more advanced skills in specific areas to meet market need – eg add managerial, policy, communications, advanced math/ stats etc courses	Medium	High	High	High	High
	Modify training programs – minor • Dedicated streams • Managerial and decision support streams • New sub programs focused on needs – more training focused in economics and "big data"	• Improve quality to better meet demand by refining is good interim step	Medium	Medium	Medium	Medium	Medium
	Modify training programs – major • Professional degrees • Joint degrees	• More radical approach needed to address this issue and redesign and disruption is required	High	High	Medium	Medium	Medium

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High/ good	Medium/ Moderate	Low/ poor						
Focus	**Option**	**Rationale**		**Impact**	**Scale**	**Flex**	**Feas**	**Collab**
Supply-Demand	Define specific opportunities within the SPOR networks to develop new approaches to training or programs to develop non-academic career paths for doctoral students. The Embedded Clinician Researcher Award proposed by IHSPR to enable innovation in community-based primary care and hospital-based care transitions – $4M over 4 year starting 2016/17; minimum of 13 awards pending partner commitments.	• Collective focus is here a good opportunity to maximize synergies with SPOR and support broader Alliance agenda with co-funding.						

Demand Side	Build focused innovative partnership programs with sustainability plan e.g. internships, private and public sector employers, business/ university partnerships in the form of a fellowship program	• Better align supply and demand
		  • Move to this approach in current or other domains/ jurisdictions
		  • Consider programs such as the MAGNET program in Israel – a cooperative venture between industry and leading academic scientific research in an area of shared interest that provides the basis for new advanced policies, products and processes[17].						

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Appendix A: Canadian Health Services and Policy Research Alliance – Training Working Group Terms of Reference

Co- Chairs: Dr. Stephen Bornstein and Dr. Steini Brown

Terms of Reference	Deliverables to Produce
To identify training and career pathways for researchers trained in pillar 3 and pillar 4 disciplines and areas wishing to work – at least for a portion of their career – in non-academic environments such as government, non-governmental organizations, healthcare providers, and industry	• Baseline foundational picture of workforce location and careers today (what is the current capacity? where do people go? where are they finding work?) • Needs assessment of HSPR network (e.g. end users, Quality Council, ministries, non-profit sector, Govt. depts., conference board, consulting firms) • Outline of career roles and associated career pathways aligned with training and education supports • Recommended required processes to support ongoing assessment/ visibility of features and location of HSPR workforce in Canada
To provide recommendations on the elements that should be included in the research-oriented (MSc and PhD) graduate training programs for people considering these innovative career paths.	• Competencies/ Curriculum elements and requirements for MSc and PhD programs in HSPR
To provide recommendations on the approach for building these skills within the current research community as part of their research training or as mid-career training to play these new types of roles	• Elements and vehicles for mid-career training and development
To outline investments that should be made on funding for the advancement of the training agenda	• Desire to identify funding opportunities in draft by May and final outline no later than September for funding in 2016

Appendix B: Annotated Bibliography

Documents	Key Findings
• Tancred T, Schleiff M, Peters DH, Balabanova D. Global mapping of health policy and system research. [place unknown]: Alliance for Health Policy and System Research; 2015 Feb [cited 2015 Mar]. Available from: http://www.healthsystemsglobal.org/Portals/0/files/Blog%20attachments/Global%20Mapping%20of%20Health%20Policy%20and%20Systems%20Research%20Training.compressed.pdf)	• Survey in 2014: 169 orgs; 59 countries; 112 respondents (all levels of HSR education) • 1. Post-training follow-up of students: only 40% of respondents reported following up with students after graduation; 20% did not know if there was a follow-up; 40% reported no follow-up • 2. Follow-up systems include: surveys/alumni surveys (~29%); alumni network/membership (~14%), social media groups, informal relationships/contact; student conferences; follow-up emails; collaborations on research; mentorship networks; alumni website • 3. Opportunities for expanding HPSR: "creating a mentorship database" - students linked to mentors • Key informants show interest in more follow-up but not feasible (institutional level barriers, lack of time, resources)
• Ricketts TC. Preparing the health services research workforce. Health Serv Res [Internet]. 2009 Dec [cited 2015 Mar];44(6):2227–2241. Available from PMC: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2796325/	• In 2007 AcademyHealthy records showed 124 HSR programs (Master, doctoral, Post-doc) within Canada and the US • The 124 programs produced an estimated 150-300 doctoral students a year
• Council of Graduate Schools and Educational Testing Service. The Path Forward: The Future of Graduate	• Increase of non-tenured and adjunct faculty • Many doctoral graduates look for options outside of academia

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Documents	Key Findings
Education in the United States [Internet]. Princeton (NJ): Commission on the Future of Graduate Education in the United States; 2010 [cited 2015 Mar]. Available from: http://www.fgereport.org/rsc/pdf/CFGE report.pdf	- Recommendations at the university level include: - Information, training and mentoring about other career trajectories - Professional development included in doctoral programs - Recommendations at the employer level: - Partnerships between business and universities e.g. internships, work-study opportunities
• The future of interdisciplinary doctoral education at Washington State University [Internet]. Washington: Washington State University; 2008 Feb [cited 2015 Mar]. Available from: http://svr.gradschool.wsu.edu/Documents/PDF/InterdisciplinaryDoctoralEducationFinal2.pdf	- Task force on interdisciplinary doctoral education in 2007 - Interdisciplinary doctorate to respond to changing requirements including flexibility and the ability to communicate at all levels - Graduate students are interested in careers outside of academia - Government and private sector careers are not "second class" anymore - Experience that is relevant to academic and non-academic careers is important (e.g. mentoring, internship)
• Grudniewicz et al. Capacity development in health systems and policy research: a survey of the Canadian context. Health Research Policy and Systems 2014 12:9.	- Investments in capacity building of HSPR in Canada: CADRE -> supported the 5 Regional Training Centres (RTCs); STIHR; CIHR's Institute for Health Services and Policy Research - They collected data from CIHR, CAHSPR and a survey of Canadian universities offering HSPR training - Results: CIHR collected data on grants to doctoral research award holders - 30% receive grants and presumably work in academia - 71.4% among post-doctoral research award holders - Survey results (Universities n=15; RTCs/STIHR n=7) - University programs: 80% do not track their students; 6.7% one-time collection; 13.3% ongoing follow-up;

Documents	Key Findings
	- All RTC/STIHR programs track either one-time or ongoing follow up
• Institute on Governance. Health services and policy research capacity building in Canada [Internet]. Toronto (ON): IOG; 2010 Jul [cited 2015 Mar]. Available from: http://iog.ca/wp-content/uploads/2012/12/2010_July_IHSPR-Capacity-Building-Report.pdf	• Capacity building in Canada: CADRE, EXTRA, STIHR, IHSPR-IPPH • Australia: Primary Health Care Research, Evaluation and Development (PHCRED) – Research links between universities and primary care service providers • CADRE – 2000 • RTC success factors included: long-term funding; support from provincial governments and other funders; providing administrative support to researchers; • RTCs dependent on funding
• Terrence Sullivan & Associates. A pan-Canadian vision and strategy for health services and policy research. Phase 1: Building the foundation [Internet]. Ottawa (ON): Canadian Institutes of Health Research; 2014 Jan [cited 2015 Mar]. Available from: http://www.cihr-irsc.gc.ca/e/47946.html	• Important developments: Canadian Health Services and Research Foundation (CHSRF/CFHI), CIHR and IHSPR; Programs like: CADRE; DSEN; Evidence on Tap and Best Brains Exchanges; Partnerships for Health System Improvements (PHSI) • Investment in HSPR between April 2007 and March 2012 ≈ $770 million; Largely funded by CIHR, MOHLTC and FRQS • Education investments: CADRE, STIHR, CAHSPR • 5.7% of the total investment was allocated to training awards (masters awards: 0.8% doctoral awards: 2.3% fellowships: 2.1%)

• Morgan S, Orr K, Mah C. Graduate attributes for master's programs in health services and policy research: results of a national consultation. Healthc Policy [Internet]. 2010 Aug [cited 2015 Mar];6(1):64-86. Available from PubMed: http://www.ncbi.nlm.nih.gov/pubmed/21804839	• Framework of competencies for HSPR Master's students.
	• 69% of key informants suggested more student interaction with the healthcare system
	• Framework:
	  - Foundational attributes of a lifelong learning: clear communicator, critical thinker, problem-solver, ethical and socially responsible, interdisciplinary, effective worker
	  - Breadth and depth of knowledge related to health and healthcare

Documents	Key Findings
	system: disciplinary depth, health systems, determinants of health, health research methods, health economic theory, evaluation, organizational theory - Application of knowledge for Health System Improvement: health systems insight and acumen, HSPR knowledge exchange, HSPR evidence synthesis, HSPR evidence creation, HSPR policy insight, HSPR methodology, HSPR theory
• DrPH for the 21st century [Internet]. Washington: Association of Schools and Programs of Public Health; 2014 Nov [cited 2015 Mar]. Available from: http://www.aspph.org/wp-content/uploads/2014/06/DrPH-Report_2014-11-05_FINAL.pdf	• "Framing the Future Task Force" formed by ASPPH • In 2014 the Doctor of Public Health (DrPH) Expert Panel was formed Key components: • Teaching training (educational methods, content and strategies) • Preparation of students for interdisciplinary roles • Mandatory practice experience to work in partnership with senior practitioners and researchers • Ability to communicate across all levels
• White Paper on the Future of the PhD in the Humanities. Institute for the Public Life of Arts and Ideas, Mc Gill University. December 2013.	• Focus of PhD programs on collaborative and interdisciplinary research • 2 kinds of PhDs: 1. Workshop PhD 2. PhD in Applied Humanities • 86% of students starting a doctoral program (Humanities) want to pursue an academic career – 20%-30% actually do. • Workshop PhD : 4 linked projects; maximum 5 years; supervised teaching assignment • PhD in Applied Humanities: 4 year program; internship; teaching assignment • Recommendations: - Mentorship for non-academic careers - Replace PhD dissertation with projects - PhD program 4-5 years

Documents	Key Findings

• Cyranoski D, Gilbert N, Ledford H, Nayar A, Yahia M. The PhD factory. Nature [Internet]. 2011 Apr [cited 2015 Mar];472(7343):276-279. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21512548	• OECD member states: 40% growth of Science doctorates (1998 to 2008)
	• Japan:
	  - Too many PhDs; 18,000 unemployed postdoctoral students in 2009
	  - Not enough academic positions
	• China:
	  - 2009: 50,000 doctoral graduates (all disciplines)
	  - Low quality
	  - Can find work in China but it is harder to get positions at international universities
	  - Pursue international postdoc positions and don't return
	• Singapore:
	  - Substantial investment in the university system
	  - Growth of PhD programs
	  - Graduates usually work outside of academia as the university system is in development
	• USA:
	  - ≈ 19,733 doctoral graduates in 2009 (life sciences and physical sciences)
	  - 1973: 55% had tenure track position six years following graduation (biological sciences); in 2006 it was only 15%
	  - Experiments with PhD programs to prepare for non-academic positions
	• Germany:
	  - 7,000 science PhDs in 2005
	  - PhD is seen as advanced training including careers outside of academia
	  - < 6% of PhD graduates in science pursue full time academic positions

Documents	Key Findings
	-> research jobs in industry
• Desjardins L. Profile and labour market outcomes of doctoral graduates from Ontario universities [Internet]. Ottawa (ON): Statistic Canada; 2012 [cited 2015 Mar]. Available from: http://www.heqco.ca/SiteCollectionDocuments/LabourMarketOutcomesDoctoral_ENG.pdf	• The overall proportion of full-time tenured and tenure track positions decreased Canada wide by 10% between 1981 and 2007 • In 1980/81 35 % of these positions were occupied by individuals under the age of 35 which reduced drastically to only 12% in 2006/2007 • In Ontario about 65% of doctoral students (class of 2005) intended to pursue a career as a university professor • In Ontario 6% of doctoral graduates were unemployed and 3% were out of the labour force (Class of 2005, 2 years after graduation) • In Ontario 27% of doctoral graduates (class of 2005) claimed that they do not need a doctoral degree for their current position • In 2005 the public sector was the main employment sector for doctoral graduates in Canada
• Maldonado, V., Wiggers, R., & Arnold, C. (2013). So You Want to Earn a PhD? The Attraction, Realities, and Outcomes of Pursuing a Doctorate. Toronto: Higher Education Quality Council of Ontario.	• In Ontario the enrollment numbers in doctoral programs increased drastically between 1999-2009 (10,192 –> 19,000) • Reasons: expected retirement; increase in undergraduate enrollment • Recommendation: Education should adjust to the fact that most doctoral graduates will not end up working in a full-time academic position
• Ferguson SJ, Wang S. Graduating in Canada: profile, labour market outcomes and student debt of the class of 2009-2010 [Internet]. Ottawa (ON): Statistic Canada; 2014 Nov [cited 2015 Mar]. Available from: http://www.statcan.gc.ca/pub/81-595-m/81-595-m2014101-eng.pdf	• In 2013, 77% of doctorates working in post-doc positions do not work in a permanent position as opposed to 28% of doctorates in non-post-doc positions • 57% of doctorates working in non-post doctorate temporary positions were working as 'university professors and post-secondary assistants' which are usually temporary

Documents	Key Findings
• Canadian Institutes of Health Research. Internal assessment for 2011 international review - CIHR Institute of Health Services and Policy Research [Internet]. Ottawa (ON): CIHR; [date unknown] [modified Aug 2011; cited 2015 Mar]. Available from: http://www.cihr-irsc.gc.ca/e/43578.html#d1	• 10-year, multi-program initiative in HSPR • Partnership between CFHI and CIHR • 83 postdoctoral awards, 12 mid-career chairs, five regional training centres and 13 career reorientation awards
• Evaluation of the CFHI/CIHR Capacity for Applied and Developmental Research and Evaluation in Health Services and Nursing (CADRE) program. Ottawa (ON): Canadian Foundation for Healthcare Improvement; 2012 Oct.	• A significantly higher percentage of individuals involved in the CADRE program were able to secure positions related to applied health services and nursing research (90% vs. 69%) • The evaluation suggests that the CADRE initiative helped to improve the availability of research positions outside of academia
• Canadian Foundation for Healthcare Improvement [Internet]. Ottawa (ON). CFHI. EXTRA; [date unknown] [cited 2015 Mar]. Available from. http://www.cfhi-fcass.ca/WhatWeDo/EducationandTraining/EXTRA.aspx	• Funded by CFHI – 14-months long program • 11 years of EXTRA • Targets health care executives • 300 fellows; 200 healthcare improvement initiatives • No new applications for 2015-16 • Renewed program in 2016/17
• Canadian Institutes of Health Research [Internet]. Ottawa (ON). CIHR. STIHR Funded programs; [date unknown] [modified 2014 Oct; cited 2015 Mar]. http://www.cihr-irsc.gc.ca/e/25171.html	• Funded by CIHR • Strategic Training Initiative in Health Research • Funding for individual training programs • First STIHR competition: 2002-2003: 86 programs funded • Second STIHR competition: 2009: 54 programs – 36 renewals, 18 new programs
• Canadian Institutes of Health Research.	• Launched in 2001

Documents	Key Findings
Strategic Training Initiative in Health Research (STIHR) – Final Evaluation Report [Internet]. Ottawa (ON): CIHR; 2008 Aug [cited 2015 Mar]. Available from: http://www.cihr-irsc.gc.ca/e/37630.html	- Evaluation in 2007: document analysis; administrative file review; web survey with STIHR principal investigators; telephone surveys with STIHR trainees - Evaluation difficult due to unclear STIHR objectives - STIHR was identified as important and relevant to the health research community - STIHR Partners were missing collaboration or interaction with funded programs
Canadian Institutes of Health Research [Internet]. Ottawa (ON). CIHR. About PHSI; [date unknown] [modified 2014 Apr; cited 2015 Mar]. http://www.cihr-irsc.gc.ca/e/34348.html	- Funded by CIHR - PHSI provides funding for project collaborations between decision makers and researchers
Conrad P. To boldly go: A partnership enterprise to produce applied health and nursing services researchers in Canada. Healthc Policy [Internet]. 2008 May [cited 2015 Mar];3(Special Issue):13-30. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2645186/	- Part of CADRE 5 RTCs: the Western Regional Training Centre (WRTC), the Ontario Training Centre (OTC), the Atlantic Regional Training Centre (ARTC), FERASI Centre in Quebec and the Centre for Knowledge Transfer - Capacity building on a master's and doctoral level - Mandatory student placements with decision-making organizations - Single training program available to students in all locations

Appendix C: Consultations

Ms. Harpreet Bassi (PhD Candidate) - Ivey International Centre for Health Innovation

Dr. Greta R. Bauer – Associate Professor and Graduate Chair Epidemiology and Biostatistics, Schulich School of Medicine & Dentistry, Western University

Dr. Stephen Bornstein – Memorial University (Department of Political Science)

Dr. Steini Brown – University of Toronto (Dalla Lana School of Public Health)

Dr. Stirling Bryan – University of British Columbia (School of Population and Public Health)

Sanjay Cherian – Vice President, Shoppers Drug Mart

Dr. Stephen Corbett – The University of Sydney (School of Public Health)

Dr. Mark Dobrow – University of Toronto (School of Public Policy and Governance)

Lindsay Hedden (PhD Candidate) – University of British Columbia (Centre for Health and Policy Research

Dr. Michael Hillmer – Ministry of Health and Long-Term Care

Mary Lewis – VP Research and Knowledge Exchange, Canada Heart and Stroke Foundation

Mr. Jonathan Mitchell - Accreditation Canada

Dr. Steve Morgan – University of British Columbia (Centre for Health Services and Policy Research)

Nelson Shen (PhD Candidate) - University of Toronto (Dalla Lana School of Public Health)

Dr. Sakia Sivananthan (PhD graduate) - University of British Columbia (Centre for Health and Policy Research)

Dr. Vasanthi Srinivasan – Executive Director of the Ontario Strategy for Patient- Oriented Research (SPOR) SUPPORT Unit
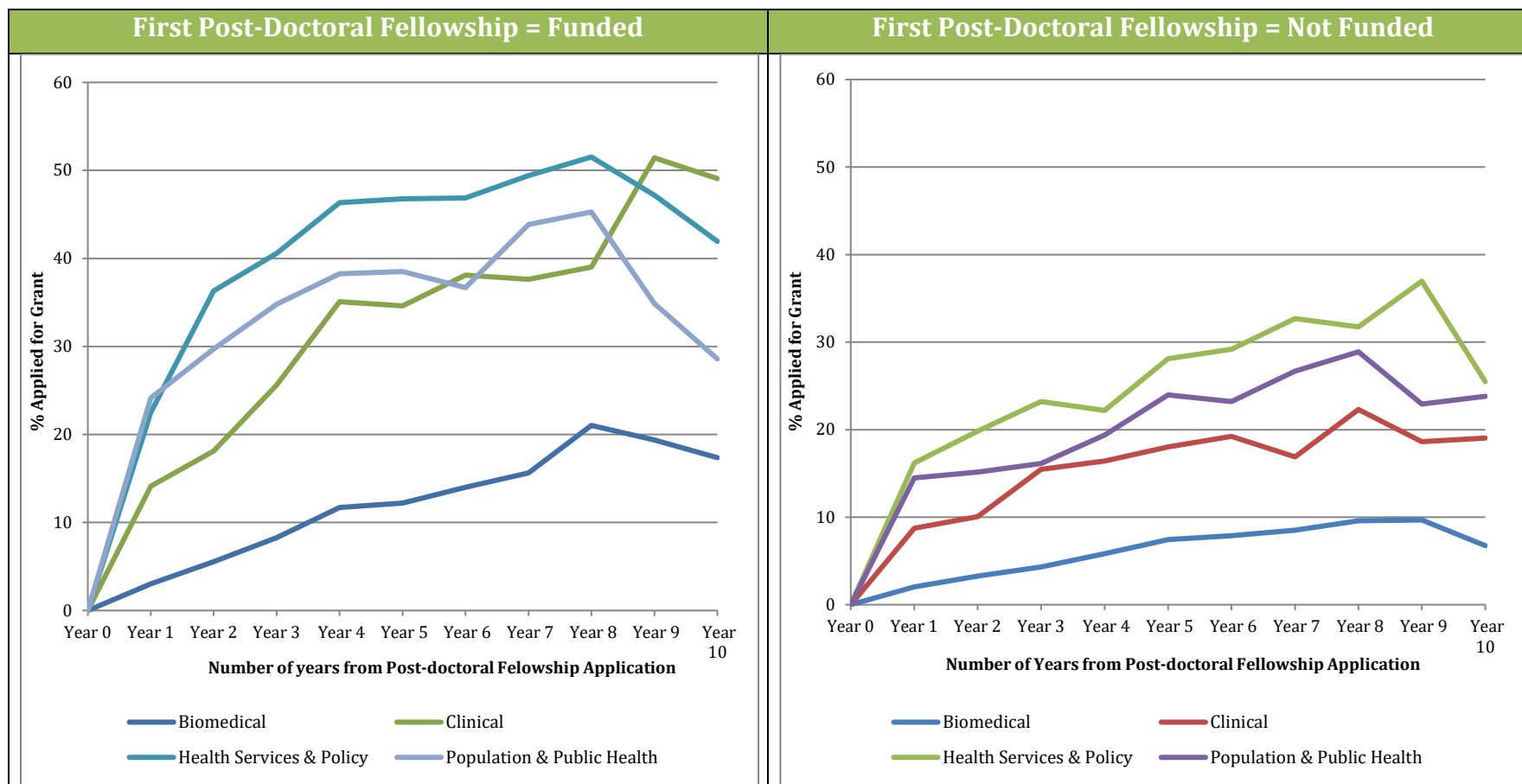
Dr. Terry Sullivan – Terrence Sullivan & Associates

Dr. Gary Teare – Saskatchewan Health Quality Council; University of Saskatchewan (School of Public Health)

Dr. Ted Witek – Boehringer Ingelheim Canada

Appendix D: Fellowship Applications

Table: Proportion of Post-doctoral Fellowship Applicants Applying for Grants during the Study Period (200[1]-2011)

Source: Institute for Health Services and Policy Research, ongoing work using CIHR application and peer review data (2003-2014)