TITLE: Health Services and Policy Research in the First Decade at the Canadian Institutes of Health Research

RUNNING HEAD: Health Services Research Funding at CIHR

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ABSTRACT

Background

Health service and policy research (HSPR) is the innovation engine of a health care system. In 2000, the Canadian Institutes of Health Research (CIHR) was formed to foster the growth of all sciences that could improve health care. We evaluated trends in HSPR funding, as well as determinants of funding success.

Methods

Between 2001-2011, 80,163 applications were submitted to the open and strategic grant competitions. Age, sex, size of research team, critical mass, season, year, and research discipline was retrieved from application information. A cohort of 4,725 applicants successfully funded between 2001-2005 were followed for 5 years to evaluate predictors of continuous funding. Multivariate GEE logistic regression was used to estimate predictors of funding success, and sustained funding.

Results

Over time, HSPR grant applications increased from 327 to 1,137, and annual funding from $16.0 to $57.3 million. Grant applications from young male HSPR scientists were 40% more likely to be funded than females (OR: 1.40; 95% CI: 1.01, 1.95), as were applications from larger research teams and institutions with a greater critical mass. Only 24.0% of scientists whose first funded grant was in HSPR had sustained 5-year

funding compared to 52.8% of biomedical scientists (OR: 0.34; 95% CI: 0.24, 0.49; p<0.0001).

Interpretation

CIHR has successfully increased the amount of HSPR in Canada. To enhance conditions for success, HSPR scientists should be encouraged to work in teams, request longer duration grants, resubmit unsuccessful applications, and affiliate with institutions with a greater critical mass.

INTRODUCTION

Health service and policy research is the innovation engine of an effective health care system. Canada officially acknowledged the need for health services research in 1969 when the federal government initiated the National Health Research Grant Program (NHRDP) [1]. Although the Medical Research Council and the Public Health Research and Development Program had already been established to support basic biomedical and communicable diseases research, it was recognized that a variety of factors influenced well-being that needed to be addressed through NHRDP-supported research on health system design and delivery. The farsightedness of this policy direction is echoed four decades later as countries grapple with the increasing prevalence of chronic disease [2], the need for interventions for lifestyle determinants of poor health [3], as well as effective strategies to support chronic disease management [4].

In 2000, the Medical Research Council and NHRDP were merged to form the Canadian Institutes of Health Research (CIHR); an exciting and ambitious experiment to foster growth of all sciences that were key to improved health for Canadians, more effective health services and products, and a stronger Canadian health care system [5]. CIHR aimed to foster a new generation of interdisciplinary collaborative research through the creation of health research institutes, and by funding the spectrum of research disciplines: bio-medical research, clinical research, research respecting health systems, health services, the health of populations, societal and cultural dimensions of health, and environmental influences on health. Health services and policy research (HSPR) was one of the thirteen founding institutes at CIHR [5]. Each Institute manages a strategic allocation of funding that is used to address emerging priorities and gaps in science that are relevant to the health of Canadians from their respective areas of science, such as aging, genetics, aboriginal health and infection and immunity. However, the majority of research funding is allocated to an open competition that aims to fund the best science and researchers by assessment of excellence by peers. While the outcomes of this ambitious initiative are still unfolding, it is possible to assess the impact this new entity on the funding of health services and policy research in Canada.

The aim of this study was to estimate funding trends in health services and policy research at CIHR compared to the biomedical, clinical, and population health communities [6]; the determinants of funding success in the open competition, and the factors associated with sustained funding among the first cohort of successful applicants.

METHODS

Design and Data Source

To assess funding trends and factors associated with funding success, we assembled a cohort of all applications submitted to the CIHR strategic and open operating grant competitions between 2001 and 2011. Application data for operating grants were retrieved from the CIHR databases and de-identified. Each application included sex, age of the applicant(s) (in 5 year categories to protect confidentiality), the applicant's role in an operating grant (principal investigator, co-principal investigator, co-investigator), the applicant's institution, the self-reported pillar of the application, whether the application has been submitted previously, whether it was a new application or a renewal, the assigned committee, amount and duration of funding requested, funding outcome, and amount and duration awarded.

To assess factors that were associated with sustained funding, the cohort of principal investigators who were awarded at least one grant between 2001 and 2005 was assembled and followed for 5 years after receiving their first grant. All records of CIHR applications and funding decisions were used to create the cohort and measure investigator-related predictors during the follow-up period. A unique encrypted identifier enabled applications from the same individual to be linked through time.

Funding Success

In the open competition, applications are assigned to one of approximately 50 standing committees. Applications are reviewed and rated by a panel of peers who score the application on a scale from 1 to 4.9. A consensus score is initially reached after the application is presented and discussed. All panel members who are not in conflict of interest, rate the application within ± 0.5 of the consensus score. The mean score for the application is used to rank applications by score. The top ranked applications within each committee are then funded. Applications with scores below a specific threshold; 3.0 between 2001 and 2003, and 3.5 from 2004 onward, are classified as being of insufficient quality to be fundable, even if funding is available. Funding success was defined as those applications that were funded in the spring and fall open operating grant competitions from 2001 to 2011.

Potential Predictors of CIHR Funding Success

Application characteristics that were measured included the year and season of the application submission (spring or fall), the pillar (biomedical, clinical, health services and policy, population and public health), the age and sex of the nominated principal investigator, the size of the research team (number of investigators listed on a grant application), whether the application was a resubmission of a previously unsuccessful application, and whether it is a new grant or renewal. Critical mass of research capacity within an institution is thought to be an important determinant of research success [7]. To measure critical mass, we measured the number of researchers who submitted applications from the same institution as the principal investigator for the same competition. Critical mass was categorized as <50 colleagues, 50-100, 100-250, 250-350 and >350 colleagues in the analysis. For subgroup analysis of the HSPR community, we measured critical mass of HSPR applications from the same institution for the same competition, classified as <10 colleagues, 10-20, 20-35, 35-50, and > 50 HSPR colleagues.

Sustained Funding

An applicant was classified as having sustained funding if they had 5 years of continuous, uninterrupted funding from CIHR. To assess sustained funding, all successful applications to strategic and open competitions as either the principal applicant or as the co-principal applicant were included. The duration of funding for each grant received was used to assess whether the applicant had continuous funding in the 5 years following their first successful grant. A principal investigator who had a gap in CIHR funding of greater than one month was classified as having un-sustained funding.

Potential Predictors of Sustained CIHR Funding

Two groups of potential predictors of sustained funding were assessed. First we measured the characteristics of the first successful application including the age and sex of the principal investigator, the pillar, the size of the research team, the critical mass of investigators at the applicant's home institution, whether the grant was new or a renewal, whether it was obtained in the open or in a strategic competition, and grant duration. Second, during the 5 year follow-up period, we measured whether the principal investigator applied to only open competitions, only strategic competitions, or both; whether they had a salary award from CIHR, whether they switched pillars or universities/ research institutes in subsequent applications, and whether they resubmitted any unfunded applications during follow-up.

Analysis

Descriptive statistics were used to characterize funding trends between 2001 and 2011, including the proportions funded, and classified unfundable, the total amount of funding for successful open and strategic grants per year, and average grant duration requested and awarded. To estimate predictors of funding success, we used multivariate logistic regression within a generalized estimating equation framework to account for clustering by principal applicant. Application was the unit of analysis, funding success was the outcome, application-related predictors were included as potential predictors, and an exchangeable correlation structure was used to account for clustering. To estimate predictors of sustained funding, multivariate logistic regression was used and principal investigator was the unit of analysis. Sustained funding was the binary outcome and potential predictors were included as covariates. As a previous report of research funding in Canada suggested that more senior female scientists were less likely to be funded than males [8], we tested whether success for female scientists was modified by age by including four dummy variables for gender-age combinations of over and under 45 years of age. All analyses were conducted in SAS 9.3.

RESULTS

Funding Trends

Between 2001 and 2011, a total of 80,163 grant applications were submitted to CIHR. Over time, there was a three-fold increase in the number of applications; from 4,411 to 12,723 overall, and from 327 to 1,137 for HSPR (Figure 1). The overall funding success rate varied by year between 38.7% and 15.8%, but showed a steady decrease from 2008 onward, commensurate with a substantial and steady increase in the number of applications. The overall funding for grants increased from $399.2 million in 2001-2 to $759.7 million in 2011-12 (Figure 2). Although funding of HSPR grants represented only 6.3% of overall funding in 2001-2, it experienced similar increases in funding, from $12.7 to $48.0 million, accounting for 3.9% of all funding in 2011-12. Applications from different pillars differed in the duration of funding requested and awarded. On average, biomedical applications requested the longest duration of funding (4.3 years) whereas HSPR applications requested the shortest (2.8 years) (Figure 3).

Predictors of Funding Success

The age and sex of the applicant modified the likelihood of funding success. Compared to female applicants under the age of 45, males of the same age were significantly more likely to be funded (OR: 1.12; 95% CI: 1.02, 1.24); particularly health services and policy applicants: OR: 1.40 (95% CI: 1.01, 1.95) (Table 1). Larger HSPR research teams had an increased likelihood of funding for health services applications but larger teams had the opposite effect—a significant reduction in the likelihood of funding when applications from all pillars were assessed; the only exception being for very large teams of 5 or more investigators. Only 7% of HSPR applications were submitted by a single investigator, compared to 61% of biomedical applications, 10% of clinical, and 10% of population health applications. The critical mass of active investigators at an applicant's home institution also increased the likelihood of funding. Applicants whose home institution had 350 or more active investigators were 67% (OR: 1.67; 95% CI: 1.47, 1.89) more likely to be funded, a linear increase in the probability of funding with increasing number of investigators. The same trend was evident for HSPR applicants, although once above 10 active investigators, the probability of funding was similar (OR: 1.73, 1.81). There were no significant differences in success rate by pillar with the exception of clinical research applications that were 21% less likely to be funded compared to biomedical research applications (OR: 0.79; 95% CI: 0.72, 0.87). The resubmission of a previously unsuccessful application significantly increased the likelihood of success, as did submission in the spring competition. Compared to 2001, there was a significant reduction in the likelihood of funding after 2004, a 16% reduction in 2005 (OR: 0.84; 95% CI: 0.74, 0.94), increasing to a 51% reduction in the probability of funding in 2011 (OR: 0.49; 95% CI: 0.42, 0.57). We could not include new versus renewal status in the models, as almost all renewal applications were from the biomedical community (88% in the first 10 years), and the models did not converge.

Predictors of Sustained Funding

Between 2001 and 2005, 4,725 principal investigators had at least one successful grant application (Table 2). Within this cohort, 334 (7.1%) classified their first successful grant as HSPR, and 444 (9.4%) applied for a health services research grant in the next 5 years, all of whom were included in the subgroup analysis. Older male investigators were 45% more likely to have sustained funding compared to females under 45 years of age (OR: 1.45; 95% CI: 1.13, 1.84), an equivalent 36% increase in the odds of sustained funding in the health services subgroup was observed, but it was not statistically significant (OR: 1.36; 95% CI: 0.62, 3.00). Of interest, older female HSPR applicants were significantly less likely to have sustained funding than younger females (OR: 0.42; 95% CI: 0.18, 1.00). Clinical, health services, and population health investigators were all significantly less likely to have sustained funding compared to biomedical investigators. Only 24.0% of health services applicants had sustained funding compared to 52.8% of biomedical applicants; a 66% reduction on the odds of sustained funding (OR: 0.34; 95% CI: 0.24, 0.49). Investigators were also less likely to be funded if their home institutions had a lower critical mass. Particularly for the subgroup of health services investigators with a 4-fold difference in sustained funding in institutions with 50 HSPR applicants compared to less than 10 applicants (OR: 3.88; 95% CI: 1.21, 12.5). Overall, a longer duration of funding awarded in the first successful grant increased the likelihood of continuous funding by 7% for each additional month requested (OR 1.07; 95% CI: 1.06, 1.08), and by 8% in HSPR (OR 1.08; 95% CI: 1.06, 1.10).

During follow-up, applicants who applied to both strategic and open competitions were more likely to be sustained compared to those who only applied to the open (OR: 0.75; 95% CI: 0.62, 0.90) or strategic (OR: 0.56; 95% CI: 041, 0.75) competitions. While similar trends existed for health services investigators, they were not statistically significant. There was a two-fold increase in sustained funding among investigators with a CIHR salary award (OR: 2.21; 95% CI: 1.81, 2.69), but not for HSPR researchers. Resubmitting an unsuccessful application during follow-up significantly increased the odds of sustained funding for health services researchers (OR: 3.79;

95% CI: 1.99, 7.22), but not for other investigators. Having research programs that encompassed more than one pillar increased the likelihood of sustained funding, particularly for health services investigators (OR: 2.20; 95% CI: 1.18, 4.11), whereas switching universities increased the odds of sustained funding by 43%, but only for all applicants (OR: 1.43; 95% CI: 1.18, 1.74).

INTERPRETATION

Between 2001 and 2011, there was a substantial increase in the number of applications submitted to CIHR, including applications for HSPR. The three-fold increase in the number of applications may be related to substantial investment in health research infrastructure by the Canada Foundation for Innovation ($1.5 billion) [9], and in world class talent through the Canada Research Chairs program ($4.2 billion) [10]. In addition, CIHR and CHSRF jointly funded regional training centers for almost a decade to boost capacity in health services research. Combined, these programs likely boosted the number and quality of applications to CIHR. While the overall budget for CIHR in the first decade was $8.7 billion, the number of applications outstripped the capacity to fund excellent projects as funding rates in the open competition dropped from 27.6% in 2001 to 18.3% in 2011, while the proportion of fundable research increased. In Canada, the ratio of federal investment in infrastructure and people, relative to operational dollars to support these researchers, was 1.5. To guide science policy, future research should assess whether a higher ratio of operating funds might be needed to maximize the return on investment in health research.

Similar factors predicted funding success of HSPR researchers and all CIHR applicants. Young male scientists were more likely to receive operating grant funding as were applicants who were housed in institutions with a greater critical mass, and with a willingness to re-submit unsuccessful grants applications. Others have noted similar differences in research funding between males and female scientists [11,12]. The most comprehensive analysis of this phenomenon was conducted with data from the Swedish Medical Research Council [11]. The investigators found that female scientists had to have 2.5 times as many impactful publications as male scientists to receive an equivalent score by peer reviewers for scientific competence; a phenomenon they attributed to reviewer bias. The European Molecular Biology Organization reported the same phenomenon in an analysis of success rates for male and female postdoctoral fellows [12], as did a subsequent team of Swedish researchers using more recent data [13].

Of interest, both the original and subsequent Swedish studies identified a "friendship bonus" or cronyism bias [11,13]. Having a colleague who was in conflict with the applicant on the review panel increased the likelihood of funding. Even though the colleague did not rate the application, they appear to have influenced the committee. Institutions with greater critical mass may have more reviewers on the panel who are in conflict, increasing the odds that applicants from these institutions will be funded. However, a larger critical mass is known to confer other benefits including research infrastructure, greater opportunities for collaboration [14,15], and professional support services that would help scientists in the institution develop and submit more polished proposals [16]. The team size was one differentiating predictor of success with health services research that was not true of the general research community. This may reflect the requirement for multiple disciplines and collaborators to be involved in HSPR to produce high quality science.

Health services researchers had a comparatively disappointing performance in obtaining sustained funding. As the average duration of funding requested by health services researchers was the shortest, and as most successful grants needed to be re-submitted to be funded, health services and policy researchers may be in a high revolution grant treadmill. To maintain continuous funding, the average HSPR researcher who requests a 2.5 year duration project would have to submit or resubmit many more applications. It is possible that HSPR scientists draw from a more diversified pool of funders and thus can sustain their research teams through other sources of funding. However, the culture of HSPR, stemming from the early days of NHRDP, was project by project-based funding. There was no support for multi-year programs of research that may be needed to address important gaps and relevant priorities. This may be why Canadian health services researchers, at least in one report, had the lowest rates of scientific productivity, as greater effort has to be made to sustain their research funding, robbing from time needed to publish [17].

CIHR has successfully increased the amount of funded health research in Canada, including HSPR. However, this sector of science still accounts for the smallest proportion of funding. If there is to be true innovation in health system reform to meet the challenges of the increasing burden of chronic disease and multi-morbidity, then greater investment in HSPR will be needed. Knowledge intensive industries invest at least 5% in research and development to sustain active innovation

[18]. With an annual expenditure of $215 billion in health care in Canada in 2014 [19], $10.75 billion should be invested in HSPR to meet the goals of health system adaptation and transformation. As health care costs amount to approximately 50% of provincial budgets, and 11% of the gross domestic product [19], there is an urgent need to act to address the research and development funding needed for system reform. The new Strategy for Patient-Oriented Research (SPOR) [20] is one initiative that will boost provincial and academic capacity to provide timely, responsive and relevant research for system transformation. The new Canadian Alliance for Health Services and Policy Research [21] provides another avenue for collaboration on a common vision and strategy for funding research and the next generation of health services and policy researchers that can engage in a learning health system.

There are important limitations that need to be considered. Information was only available for CIHR applications, not all potential sources of support. While this limitation will not influence factors associated with CIHR funding success, it may bias the estimated prevalence of sustained funding and the factors associated with it. Moreover, scientific productivity was not measured, nor peer review reliability and validity. These are important areas for future research to understand gender differences in funding success rates and establish appropriate policy to enable optimal peer review.

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Table 1: The Association between Application Characteristics and Funding Success for 33 155 New Applications submitted to the Open Operating Grant Competition between 2001 and 2011.

Application Characteristics	All Applications (N=33155)					Health Services and Policy Applications (N=2498)				
	Number Applications	% Funded	Odds Ratio	95% C.I.	P-Value	Number Applications	% Funded	Odds Ratio	95% C.I.	P-Value
Age and Sex (PI)										
Female, under 45	4379	21.4	Ref			487	19.1	Ref		
Female, over 45	4379	19.9	0.91	(0.8-1.01)	0.08	603	19.2	0.99	(0.72-1.36)	0.94
Male, under 45	8757	23.2	1.12	(1.02-1.24)	0.02	489	24.5	1.40	(1.01-1.95)	0.04
Male, over 45	12199	21.3	1.00	(0.91-1.10)	0.97	645	21.4	1.10	(0.79-1.52)	0.57
Missing Age or Sex	3441	18.3	0.80	(0.71-0.91)	<0.005	274	19.0	1.02	(0.70-1.49)	0.91
Institutional Critical Mass (HSR)										
<50 applicants (<10)	2500	16.0	Ref			352	11.9	Ref		
50-100 (10-20)	1330	19.5	1.15	(0.95-1.40)	0.15	110	20.9	1.73	(0.96-3.13)	0.07
100-250 (20-35)	3662	19.2	1.27	(1.09-1.47)	<0.005	516	21.7	1.74	(1.18-2.57)	0.005
250-350 (35-50)	9458	21.2	1.45	(1.27-1.65)	<0.0001	335	22.4	1.83	(1.21-2.76)	<0.005
350+ applicants (50+)	16205	22.9	1.67	(1.47-1.89)	<0.0001	1185	23.7	1.81	(1.28-2.57)	<0.005
Number of Co-Investigators										
1 co-investigator	14247	23.4	Ref			179	13.4	Ref		
2 co-investigators	5274	16.8	0.71	(0.65-0.77)	<0.0001	186	15.1	1.19	(0.68-2.11)	0.54
3 co-investigators	3892	19.4	0.86	(0.78-0.95)	<0.005	298	14.8	1.15	(0.68-1.97)	0.60
4 co-investigators	2838	19.8	0.93	(0.83-1.04)	0.19	351	17.1	1.28	(0.76-2.15)	0.35
≥5 co-investigators	6904	22.2	1.11	(1.01-1.22)	0.03	1484	24.5	2.08	(1.33-3.26)	<0.005
Pillar										
Biomedical	21321	21.6	Ref			NA				
Clinical	5394	18.7	0. 79	(0.72-0.87)	<0.0001					
Health Services/Policy	2498	20.8	0.91	(0.80-1.03)	0.13					
Pop and Public Health	3588	20.3	0.95	(0.85-1.06)	0.35					
Missing	354	63.0	8.12	(6.22-10.7)	<0.0001					
Resubmission										
No	17708	17.2	Ref			1554	16.9	Ref		
Yes	15447	26.1	1.92	(1.82-2.03)	<0.0001	944	27.1	1.83	(1.51-2.23)	<0.0001
Season										
Fall	16429	20.5	Ref			1262	19.7	Ref		
Spring	16726	22.1	1.11	(1.06-1.17)	<0.0001	1236	21.8	1.14	(0.93-1.39)	0.20
Year										
2001	2416	27.6	Ref			225	20.9	Ref.		
2002	2623	25.6	0.95	(0.84-1.07)	0.40	221	21.7	0.94	(0.60-1.46)	0.77
2003	2581	24.9	0.97	(0.85-1.09)	0.58	216	25.5	1.00	(0.64-1.57)	0.99
2004	2597	24.3	0.94	(0.83-1.07)	0.33	198	26.3	1.16	(0.73-1.86)	0.52
2005	3134	22.3	0.84	(0.74-0.94)	<0.005	226	23.0	0.95	(0.61-1.47)	0.81
2006	3294	18.2	0.63	(0.56-0.72)	<0.0001	213	16.0	0.58	(0.34-0.99)	0.05

2007	3309	24.5	0.87	(0.77-0.98)	0.02	252	25.8	1.06	(0.70-1.62)	0.77
2008	3315	20.9	0.71	(0.63-0.80)	<0.0001	235	20.4	0.73	(0.46-1.17)	0.19
2009	3622	17.5	0.57	(0.51-0.65)	<0.0001	227	15.4	0.55	(0.34-0.92)	0.02
2010	4151	16.4	0.51	(0.45-0.58)	<0.0001	330	17.6	0.68	(0.43-1.08)	0.10
2011	4654	18.3	0.49	(0.42-0.57)	<0.0001	320	19.4	0.55	(0.31-0.95)	0.03

Table 2: The Association between Application Characteristics and Odds of Sustained Funding among the 4,725 Principal Investigators who Received Funding for a Grant Application between 2001 and 2005.

	All Applications (N=4,725)					Health Services and Policy Applications (N=444)				
Applicant Characteristics	Number Applications	% Sustained	Odds Ratio	95% C.I.	P-Value	Number Applications	% Sustained	Odds Ratio	95% C.I.	P-Value
Age and Sex (PI)										
Female, under 45	633	32.9	Ref.			80	31.3	Ref.		
Female, over 45	578	36.2	1.21	(0.90-1.63)	0.20	104	19.2	0.42	(0.18-1.01)	0.05
Male, under 45	1346	43.7	1.18	(0.93-1.50)	0.17	88	22.7	0.65	(0.28-1.54)	0.33
Male, over 45	1611	48.0	1.45	(1.13-1.84)	0.003	129	35.7	1.36	(0.62-3.00)	0.45
Missing Age or Sex	557	31.8	1.00	(0.74-1.35)	0.98	43	25.6	0.52	(0.18-1.48)	0.22
Characteristics of the First Funded Grant										
Institutional Critical Mass										
<50 applicants (<10)	512	21.1	Ref.			48	10.4	Ref.		
50-100 (10-20)	178	21.9	1.32	(0.79-2.20)	0.29	64	23.4	2.28	(0.62-8.35)	0.21
100-250 (20-35)	1000	43.1	1.85	(1.37-2.51)	<0.0001	91	26.4	2.79	(0.83-9.35)	0.09
250-350 (35-50)	902	45.1	2.04	(1.50-2.79)	<0.0001	105	35.2	3.83	(1.19-12.4)	0.02
350+ applicants (50+)	2133	45.5	2.03	(1.52-2.70)	<0.0001	136	30.1	3.88	(1.21-12.5)	0.02
Number of Co-Investigators										
1 co-investigator	2544	46.7	Ref.			34	29.4	Ref.		
2 co-investigators	558	37.8	0.76	(0.61-0.96)	0.02	28	25.0	1.36	(0.28-6.73)	0.70
3 co-investigators	432	29.9	0.67	(0.50-0.88)	0.004	51	11.8	0.59	(0.12-2.87)	0.51
4 co-investigators	309	33.0	0.84	(0.61-1.16)	0.28	59	23.7	1.08	(0.26-4.51)	0.91
≥5 co-investigators	882	36.8	1.06	(0.82-1.36)	0.66	272	31.3	1.22	(0.33-4.47)	0.76
Pillar										
Biomedical	2698	52.8	Ref.			NA				
Clinical	484	36.4	0.47	(0.36-0.62)	<0.0001					
Health Services/Policy	334	24.0	0.34	(0.24-0.49)	<0.0001					
Pop and Public Health	523	26.6	0.52	(0.39-0.71)	<0.0001					
Missing	686	20.0	0.77	(0.58-1.02)	0.06					
Funding Source										
Open Competition	2934	51.5	Ref.			210	32.4	Ref.		
Strategic Competition	1791	24.8	1.11	(0.92-1.34)	0.27	234	23.1	1.36	(0.76-2.44)	0.30
Grant Type										
New Grant	3615	33.7	Ref.			430	26.5	Ref.		
Renewal	1110	66.6	3.01	(2.48-3.66)	<0.0001	14	57.1	2.32	(0.39-13.9)	0.36
Duration of Grant (per month)	4725	41.8 (19.8)	1.07	(1.06-1.08)	<0.0001	444	37.7 (19.7)	1.08	(1.06-1.10)	<0.0001
Applicant and Application Characteristics During Follow-up										

Funds Applied for: Follow-up										
Both Open & Strategic	2644	48.9	Ref.			289	36.3	Ref.		
Open only	893	42.9	0.75	(0.62-0.90)	0.002	38	26.3	0.70	(0.34-2.04)	0.52
Strategic Only	506	27.1	0.56	(0.41-0.75)	<0.0001	71	7.0	0.39	(0.13-1.19)	0.10
Had a CIHR Salary Award										
No	3949	38.0	Ref.			381	25.7	Ref.		
Yes	776	58.9	2.21	(1.81-2.69)	<0.0001	63	38.1	1.3	(0.64-2.66)	0.47
Resubmission during follow-up										
No	2269	40.3	Ref.			207	14.5	Ref.		
Yes	2456	42.4	1.10	(0.94-1.29)	0.22	237	38.8	3.79	(1.99-7.22)	<0.0001
Applications to Multiple Pillars										
No	3583	41.4	Ref.			177	16.4	Ref.		
Yes	1142	41.4	1.63	(1.34-1.98)	<0.0001	267	34.8	2.20	(1.18-4.11)	0.01
Switched Universities										
No	3735	40.9	Ref.			281	25.6	Ref.		
Yes	990	43.1	1.43	(1.18-1.74)	0.0002	163	30.7	1.11	(0.63-1.98)	0.71

* model adjusted for amount requested

Figure 1 Number of Open and Strategic Grant Applications by Year, Pillar and Funding Status (2001-2011)

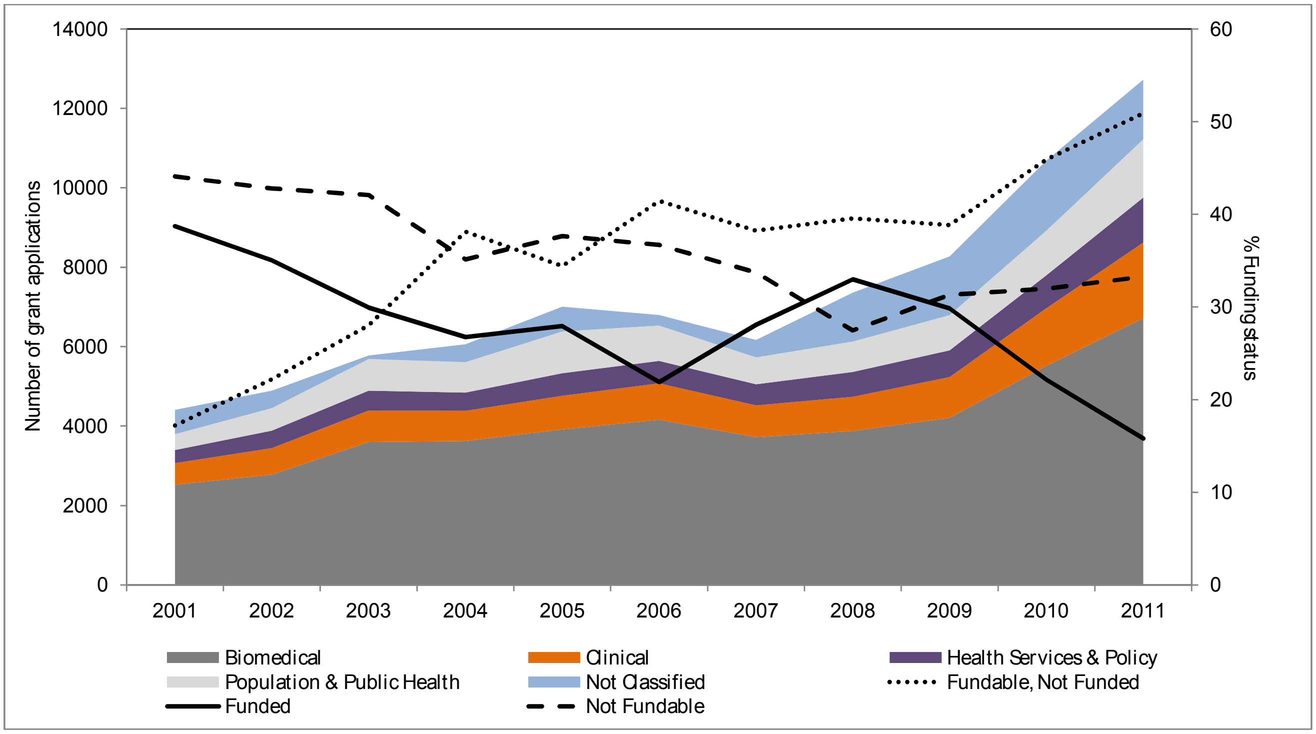
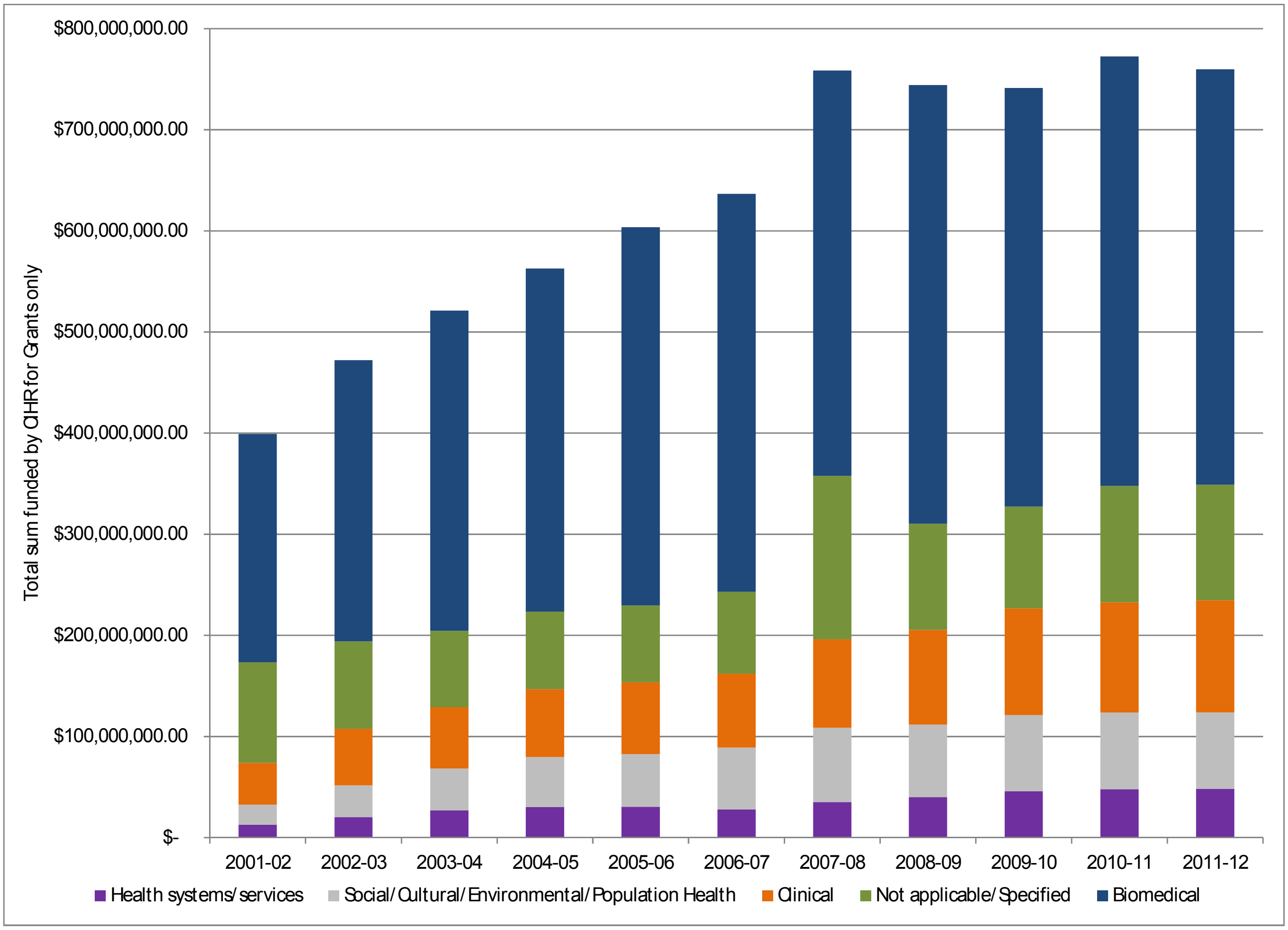


Figure 2 Total Funding Awarded to Open and Strategic Grant Applications by Fiscal Year and Pillar (2001-2011)[1]



[1] The amount in each fiscal year represents the first year expenditure for new grants awarded as well as subsequent years of funding for grants awarded in previous years. As data were only available for new grants starting in the 2001-02 fiscal year (not amounts awarded through the prior awards at MRC and NHRDP), the sum is artificially lower in the 2001-02 and 2002-03 fiscal years

Figure 3 Duration of Grant Funding Requested and Awarded for Open and Strategic Operating Grant Applications (2001-2011)