



Canadian Institutes
of Health Research

Instituts de recherche
en santé du Canada

Balance of **Funding** in
Canadian Health Research
and Future Funding Requirements



CIHR IRSC

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EXECUTIVE SUMMARY

The objectives of this report are:

1. To update estimates of federal funding originally published by CIHR in 2004¹, and to extend the scope of the estimates to include provincial health research funding and funding by the private not-for-profit (NFP) sector.
2. To estimate the future demand for health research and requirements for health research funding.

The report contains an introduction and two sections. The first section provides health research funding estimates by federal, provincial and private not-for-profit (NFP) sectors. The three sectors accounted for over \$1.9 billion of health research funding 2003-04, with the federal sector responsible for 66%, the provincial sector 24% and the NFP sector 10%.

The estimates include an analysis of how funding is distributed between research grants, salary & training, infrastructure (capital expenditures), indirect costs and provincial support for research centres. There are distinct profiles for each funding sector. Research grants comprise the largest expenditure category for each sector. Training & support and research centres each account for approximately 30% of funding by provincial research agencies, but they are less prominent in federal funding. When infrastructure support by provincial departments of development is included, the provincial profile changes, with 23% of total provincial funding allocated to capital expenditures. The federal sector accounts for higher capital expenditures than the provincial sector in absolute terms, but capital expenditures account for only 14% of federal expenditure.

The second section examines the increasing demand for health research and the requirement for health research funding. CIHR research grant funding requirements in 2007-08 are estimated using assumptions about the growth in the community of researchers supported by CIHR and the levels of support to be achieved in future. This section also contains a synthesis of information and opinions provided by executives of research funding agencies and organizations in the public and NFP sectors.

Specific conclusions:

- Current trends indicate that CIHR will require an annual budget increase of \$150 million in fiscal 2007-08 to meet its funding requirements.
- Investments in both human capital and infrastructure have led to a rapid expansion of research capacity. Increasingly, the focus is shifting to the future sustainability of funding for higher education and research.
- While there is a considerable opportunity to commercialize intellectual property and to attract additional investments from industry, these financial returns do not have the potential to replace public sector funding for basic research.
- The challenge for funding agencies and the research community will be to develop innovative and relevant models of health research that will increase the impact of research on society while maintaining commitments to meet reasonable expectations for support from an expanding research community.

ABBREVIATIONS

AFMC	-	Association of Faculties of Medicine of Canada
AHFMR	-	Alberta Heritage Foundation for Medical Research
CFI	-	Canada Foundation for Innovation
CGS	-	Canada Graduate Scholarships
CHSRF	-	Canadian Health Services Research Foundation
CIHI	-	Canadian Institute for Health Information
CIHR	-	Canadian Institutes of Health Research
CPHI	-	Canadian Population Health Initiative
CRC	-	Canada Research Chairs
FRSQ	-	Fonds de la recherche en santé du Québec
GBAORD	-	Government Budget Appropriations and Outlays for Research and Development
GDP	-	Gross Domestic Product
GERD	-	Gross Expenditure on Research and Development
MSFHR	-	Michael Smith Foundation for Health Research
NCE	-	Networks of Centres of Excellence
NIH	-	National Institutes of Health
NRC	-	National Research Council
NSERC	-	Natural Sciences and Engineering Research Council
NSHRF	-	NS Health Research Foundation
OECD	-	Organisation for Economic Co-operation and Development
R&D	-	Research and Development
SSHRC	-	Social Sciences and Humanities Research Council

CONCEPTUAL FRAMEWORK FOR CLASSIFYING HEALTH RESEARCH EXPENDITURES

Health Research Expenditures

'R&D programs directed towards the protection and improvement of human health.

(Includes food hygiene and nutrition, medical radiation, biochemical engineering, medical information, rationalisation of treatment and pharmacology, epidemiology, prevention of industrial diseases and drug addiction.)
OECD, Frascati Manual, 1994.ⁱⁱ

Health Research Funding in Canada

Funding by agencies dedicated to furthering health research or funding by other agencies that fits the definition of health research.

CIHR: All funding

NSERC & SSHRC:

- Funding to projects that have health research as the primary objective.

Other agencies or programs:

- Funding for health projects, researcher training & support for health research infrastructure (e.g. laboratories)
- A share of funding for intellectual resources for research that serves several disciplines (e.g. libraries, research platforms).

Allocation of Health Research Funding

Infrastructure and Equipment: the costs of well-equipped research facilities.

Types of Infrastructure:

- Capital Investment, upgrades and maintenance (buildings and technology)
- Equipment
- Information Resources (databases, research platforms, information systems and library documents)

Uses of infrastructure:

- Project specific
- Shared resources (e.g. libraries, labs and lab equipment)

Human Resources: Academic training and the development of specialized skills. Salary support for researchers.

Goal Oriented Research: Research projects designed to further knowledge about the protection and promotion of health. Includes both *investigator-initiated* research and *strategic research* where topics are identified by funding agencies.

Knowledge Translation: The translation of health research results into forms that will influence decision-making in the health policy or medical practice sectors. The development of commercial products from health research.

Communications & Collaboration: Activities that promote sharing of knowledge or the development and implementation of standards to guide research activities (e.g. workshops, ethics guidelines).

Clarification Notes

There is a tendency among some stakeholders to expand the definition of infrastructure to include support for researchers or research teams. In this conceptual framework human resources and infrastructure are distinct categories. This distinction is made in the interests of precision in financial estimates.

The scope of the estimates in this framework is limited to resources that are dedicated to research as a *primary goal* or a *shared goal* (e.g. research and teaching in academic activities). Knowledge resources that serve many purposes (such as surveys or databases of Statistics Canada and CIHI) are not included.

Demand for Health Research

Demand for health research: A derived demand that flows from the desire to improve prevention, public health, health care and health systems. Effective demand by society for health research implies a willingness to fund health research with public resources.

Requirements for Health Research Funding: Estimates of the amount of funding required to respond effectively to public demand for research, given the capacity of the research community.

INTRODUCTION

Canada's Innovation Strategy recognizes the importance of research to economic growth, future productivity and the nation's ability to adapt to changing social and industrial exigencies that result from globalization.

The present research funding strategy is four pronged, including support for research activities in the form of research grants and indirect costs; and support for enhanced capacity in the form of training and salary support for human resources and capital grants for new infrastructure. New federal funding programs, which bridge the traditional boundaries of the three main research funding agencies¹, have been developed. These programs include the Canada Foundation for Innovation (CFI, 1997), Genome Canada (2000), Canada Research Chairs (CRC, 2000) and Indirect Costs (2003).

Provincial health research funding agencies have expanded their activities during the last decade. Provinces have established new funding mechanisms to provide co-funding for large infrastructure projects in which CFI or Genome Canada is the federal funding agency. The private not-for-profit (NFP) sector continues to play an important role in funding research and training.

Partnerships within the research community and between the academic and commercial sectors are essential to future uptake of, and support for, research. Partnerships involve combinations of federal and provincial public sector agencies, private not-for-profit agencies and private industry.

This paper was commissioned by CIHR as a follow-up to a paper published in September 2004, which examined the allocation of federal health research funding in fiscal 2001-02 and projected funding to fiscal 2004-05. The present study updates the data and provides projections to 2007-08. This report also extends the scope of its estimates to include provincial and NFP funding for health research. Specific objectives were:

- update estimates from 2004 of the distribution of federal funding between the functional areas of research grants, human resources, infrastructure and indirect costs;
- extend the estimates to include provincial agencies and NFP organizations and develop a set of estimates of total research funding across functional areas; and
- estimate future requirements for CIHR funding as a result of decisions made by external organizations and as a result of internal programs and policy decisions (such as training and other capacity-building programs).

Section 1 of the report provides estimates of health research funding from 2003-04 to 2007-08 by funding sector. Estimates for 2003-04 are broken down into the functional categories of research grants, training & salary support, infrastructure (capital), indirect costs, support for research centres and administrative costs. Section 2 examines the future demand for health research and funding required to maintain CIHR support at present levels. It includes a conceptual model to analyze demand for health research, estimates of CIHR funding requirements in 2007-08 based on the growth of research capacity and a synthesis of expert opinion.

¹ NSERC, SSHRC and CIHR



Section 1:

HEALTH RESEARCH FUNDING BY SECTOR AND CATEGORY

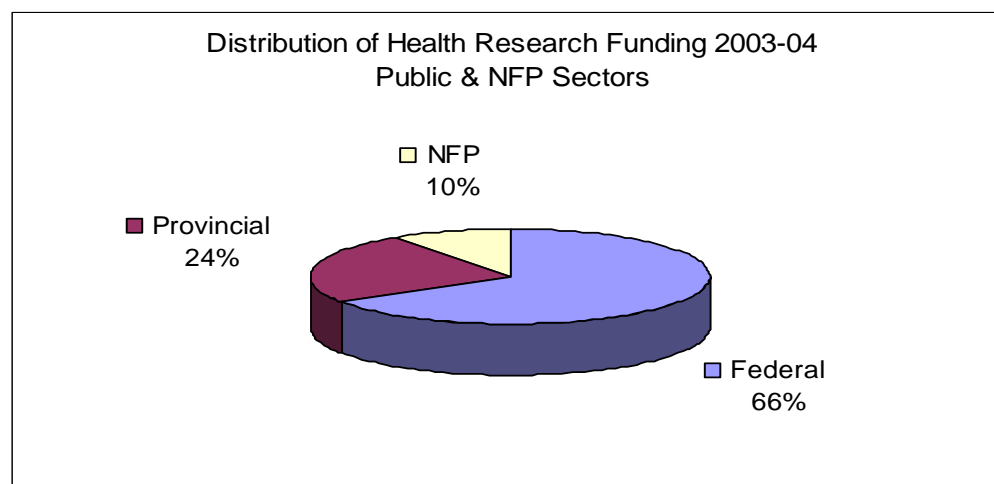
Estimates for fiscal 2003-04 by sector and category are summarized in Table 1. Total health research funding by government and private not-for-profit funders exceeded \$1.91 billion in 2003-04, with research grants, training & support for researchers and capital expenditures accounting for the largest amounts. Federal funding sources accounted for 66% of the total, while the provincial and NFP sectors accounted for 34% (Figure 1).

Table 1
Estimates of Health Research Funding by Sector and Category
Fiscal 2003-04 (\$'000)

	FEDERAL	PROVINCIAL AGENCIES	OTHER PROVINCIAL	TOTAL PROVINCIAL	PRIVATE NFP	TOTAL
Research Grants	807,927	106,398	38,014	144,412	143,021	1,095,360
Training & Support	159,001	94,358	12,175	106,533	24,055	289,589
Capital - major	148,876	0	104,574	104,574	104	253,554
Capital - equipment	8,401	3,080		3,080	0	11,481
Research Centres	0	89,759	2,748	92,507	0	92,507
Indirect costs	79,585	0		0	0	79,585
Admin costs	53,987	15,995		15,995	7,944	77,927
Sub-Total	1,257,776	309,590	157,511	467,101	175,125	1,900,001
Unallocated					11,092	11,092
Total	1,257,776				186,217	1,911,093

Note: Other Provincial consists of provincial co-funding and Cancer Agencies.

Figure 1



Public Sector funding

Federal Sector:

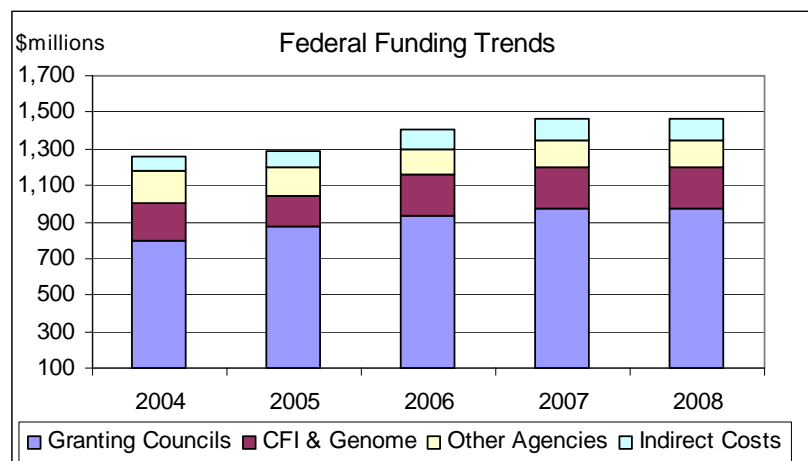
Table 2 shows a breakdown by organization of funding in fiscal 2003-04 and 2004-05.

Table 2
Health Research Funding by Federal Agencies and Organizations

FEDERAL AGENCIES	2003-04 (\$000)	2004-05 (\$000)
CIHR	693,862	757,876
NSERC	88,384	96,848
SSHRC	11,966	15,889
CFI	142,852	115,627
Genome Canada	62,005	60,811
NRC	63,522	76,582
Health Canada	103,000	62,000
CHSRF	10,400	10,400
Others	2,200	2,267
Indirect Costs	79,585	87,789
Sub-Total	1,257,776	1,286,089
INCLUDED IN CIHR ESTIMATES ABOVE:		
Canada Research Chairs	46	61
Networks of Centres of Excellence	25	25
Canada Graduate Scholarships	2	5

Projections of funding trends from 2003-04 to 2007-08 are shown in Figure 2. These projections are subject to uncertainty but they provide an indication of total spending over the five year period based on budgets or funding commitments made to date.

Figure 2



The three granting councils show modest increases each year, reaching a combined total of \$980 million by 2007-08. Funding estimates for CIHR are from the 2005 *Plans & Priorities* report plus increases in the 2005 and 2006 federal budgets for the CIHR base budget and special initiatives. Canada Research Chairs funding is provided by the CRC program. The projections assume all Chairs allotted to CIHR will be filled by 2008. NSERC and SSHRC funding estimates are based on grants and associated administration costs for the subject areas of public health and mental health. Future years estimates are based on budget projections in plans and priorities reports.²

Annual projections of CFI and Genome expenditures are subject to more uncertainty than the granting councils. These organizations invest in large multi-year projects and competitions are not evenly spaced through time (e.g. CFI awarded \$738 million in fiscal 2003-04 and \$180 million in 2004-05). Each organization provided estimates of funding for the health sector based on commitments made in competitions to date. Both organizations publish detailed annual reports that include an accounting of all funds disbursed. Neither organization is required to publish plans and priorities reports, however, and it was necessary to forecast future disbursements based on program budgets and commitments made in competitions held to date.

The CFI forecasts beyond 2004-05 are based on amounts committed but not disbursed, plus the remaining CFI budget of \$1.5 billion, which is to be committed by 2010. The estimates assume equal annual commitments of the unallocated portion and a 5 year project completion cycle for projects funded. Increases of \$20 million per year contained in the 2006 budget are included with data for fiscal years ending in 2007 and 2008.

Genome Canada disbursements to 2004-05 are from annual reports. Genome completed Competition 3 during the summer of 2005, with approximately \$346 million awarded. Genome estimates that \$155 million of this amount will be disbursed over the next three years. Investment plans by the award recipients have not been finalized and the forecasts in Figure 2 assume disbursements in equal amounts each year.

The Other Agencies group is expected to have approximately the same level of funding between 2004-05 and 2007-08. NRC provided information on expenditures to 2004-05. A review of trends over the last seven years indicates that health expenditures (concentrated in biopharmaceutical and biodiagnostic expenditures) have been relatively constant with some year to year variation. Health Canada estimates for 2003-04 to 2005-06 were obtained from Statistics Canada.ⁱⁱⁱ CHSRF provided expenditure estimates for its main programs (research and capacity building) to 2008; present funding levels are expected to be maintained. The last agency in this group is the Canadian Population Health Initiative (CPHI) of the Canadian Institute for Health Information (CIHI). CPHI was expected to finalize its research grant budget in 2004-05 and the remaining funds in its budget allocation will be used for policy synthesis and knowledge exchange.

Indirect costs consist of the Indirect Costs program administered by SSHRC, which provided estimates of the share attributable to CIHR funded research. The Indirect Costs program budget was increased by \$20 million in the 2004 federal budget and an additional \$15 million in the 2005 budget. The CIHR share increased from 31.7% to 39% between 2001-02 and 2004-05.

² The November 2005 Economic Update included a commitment to provide an additional \$35 million to CIHR and substantial increases for CFI and the Indirect Costs program in future years. The commitments in the Update were not passed by Parliament, however, and have not been included in these estimates.

Provincial Sector:

Provincial sector funding agency estimates are broken down by province in Table 3. Funding for provincial cancer agencies and provincial co-funding for projects in which the federal funding agency is CFI, Genome Canada or NCE are summarized for all provinces.

Co-funding for federal programs is usually provided by provincial departments of development or other provincial sources and is not managed by provincial research funding agencies. Another important difference between provincial agency funding and co-funding is that provincial agency funding is based on year-to-year budgets whereas provincial co-funding was estimated based on (1) the provincial share of total funding for projects, (2) the share of project funds allocated to health and (3) annual disbursements by CFI, Genome and NCE. As such, the annual allocations of co-funding should be treated as approximations based on total commitments.

Table 3
Health Research Funding by Provinces – 2003-04

AGENCY AND PROVINCE	AMOUNT (\$000)
NS Health Research Foundation (NSHRF)	5,014
Other Atlantic Provinces	513
Fonds de la recherche en santé du Québec (FRSQ)	83,968
Ontario MOH & Dept of Innovation	135,000
Manitoba ³	3,350
Sask. Health Research Foundation	6,343
Alberta Heritage Foundation for Medical Research (AHFMR)	52,528
Michael Smith Foundation for Health Research (MSFHR)	22,874
Sub-Total - Funding Agencies	309,590
Cancer Agencies	24,350
Provincial Co-Funding	133,161
Total	467,101

Provincial agencies usually do not publish forecasts of future expenditures. When asked to estimate budgets in 2007-08, three agencies indicated that they expected to receive significantly higher funding:

- NSHRF is requesting a budget of \$10 million by 2007-08,
- AHFMR should see its budget increase to approximately \$63 million based on increases totaling \$500 million over the next three years that will bring its endowment to approximately \$1.4 billion, and an estimated 4.5% of the endowment used to fund annual budgets.
- MSFHR is forecasting an annual budget of \$54 million by 2007-08 following a 3-year funding commitment of \$100 million from the BC government in 2005.

If these projections are realized, provincial health research agency funding could increase by \$38 million, or 11.4%, by fiscal 2007-08.

³ Includes the Manitoba Health Research Council and Ministry of Health funding for the Manitoba Centre for Health Policy.

Cancer agency funding includes cancer care agencies in BC, Alberta, Manitoba, Ontario and NS. Saskatchewan Cancer Care research activities are funded by SHRF and federal granting agencies.

Private Not-for-Profit Sector

The private not-for-profit (NFP) sector includes funding by charities and foundations. The estimates reviewed here do not include all NFP funding, but they are believed to include the main health research funders. Table 4 provides a breakdown by agency.

Table 4
Health Research Funding by NFP Agencies – 2003-04

AGENCY	AMOUNT (\$000)
National Cancer Institute of Canada	65,001
Heart & Stroke Foundation	54,465
BC Cancer Foundation	11,092
MS Society	10,589
The Arthritis Society	7,300
Cystic Fibrosis Foundation	6,616
Cdn. Diabetes Association	5,600
Canadian Blood Services	5,340
CBCRA - Other NFP partners	4,900
The Kidney Foundation	3,700
Crohn's and Colitis Foundation	3,603
Sick Kids Foundation	2,700
Dalhousie Medical Research Foundation	1,877
Canadian Foundation for AIDS Research	1,424
Others	2,010
Total	186,217

The National Cancer Institute of Canada (NCIC) is funded by the Canadian Cancer Society and the Terry Fox Foundation. Other significant funders of cancer research include the BC Cancer Foundation (BCCF), which owns the BC Cancer Research Centre. The \$11 million annual contribution to research by the BCCF was not distributed by category in Table 1. BCCF funding includes infrastructure, operating costs and grant funding, but the proportions are not published. The Canadian Breast Cancer Research Alliance (CBCRA) is a five year project running from 2004 to 2008. Amounts shown in Table 4 consist of annualized contributions by agencies other than CIHR and NCIC (i.e. Canadian Cancer Society, Canadian Breast Cancer Foundation and Avon Flame).

The category, 'Others' includes agencies with amounts less than \$1 million in 2003-04 (Canadian Lung Association, Canadian National Institute for the Blind and the Parkinson Society). Amounts in Table 4 were obtained from interviews with agency officials, annual reports on websites and annual reports filed with the Canada Revenue Agency (CRA).

The CRA Charities annual report database includes approximately 8,000 charities.^{iv} The Association of Faculties of Medicine lists approximately 300 NFP that have contributed to research in medical faculties.^v It would be very difficult to document all NFP sources of funding, but it seems likely that further attempts to expand the estimates would yield relatively small increments to the total identified to date.

Foundations

The estimates above include foundations associated with the Sick Children's Hospital in Toronto and Dalhousie University in Halifax. The amounts included were identified as funding for research grants or fellowships. These foundations and other foundations or financial trusts also fund capital projects in universities or teaching hospitals and many of these projects include research infrastructure. These capital contributions are not included in the NFP estimates but they are believed to represent a substantial component of the institutional co-funding contribution for federal infrastructure programs funded by CFI. Institutional co-funding is discussed further in the sub-section, Partner Funding.

Categories of Funding

The Association of Universities and Community Colleges (AUCC) has developed a conceptual model of research funding in Canada. The model, which has four dimensions, is reproduced in Figure 3 with categories from Table 1 embedded in the major categories. The model can be sub-divided into elements of research funding (left side) and capacity building (right side). Table 1 includes an additional category for administrative costs. The analysis in this section use terminology from Table 1, with the two capital sub-categories combined.

Figure 3
Conceptual Model of Research Funding Categories

Direct Costs of research <i>Research Grants</i>	Infrastructure <i>Capital - Major, Capital - Equipment</i>
Indirect Costs of research	Human Resources <i>Training and Salary Support</i>

Provincial estimates include a category of funding for provincial research centres located in universities or teaching hospitals. This type of funding is included in the portfolios of funding agencies in several provinces, especially Quebec, Ontario and British Columbia. Provinces do not use consistent terminology to refer to this type of funding (for example, the Michael Smith Foundation refers to it as infrastructure funding). The factors that distinguish funding for research centres from other types of funding are:

- funding is not associated with an individual research project or researcher,
- funding supports the full range of activities of the centre, including minor capital and some indirect costs (but not capital or indirect costs of the host institution),
- training and networking are important components of supported activity in most cases.

Indirect costs of health research in federal estimates consist of the CIHR share of funding from the Indirect Costs program.

There is a gray area between infrastructure and indirect costs.. The Indirect Costs program *facilities* category includes items that could be considered infrastructure costs, such as maintenance. Similarly, CFI provides an *Infrastructure Operating Fund* that includes maintenance and could overlap with items included in the Indirect Costs program. In these estimates all CFI funding is counted as infrastructure and all Indirect Costs program funding is counted as indirect costs.

Sector Allocations by Category (figures 4 to 7)

- In federal funding research grants comprise the largest category of expenditure, at 64%, followed by infrastructure (capital) and training & support with equivalent shares.
- Provincial agencies allocate 35% to research grants, closely followed by training & support and research centres with almost equal shares.
- In total provincial funding capital has a higher proportion, due to the fact that co-funding for CFI projects represent approximately two-thirds of the other provincial sector estimate.

Private NFP funding is concentrated in research grants. followed by training & support.

Figure 4

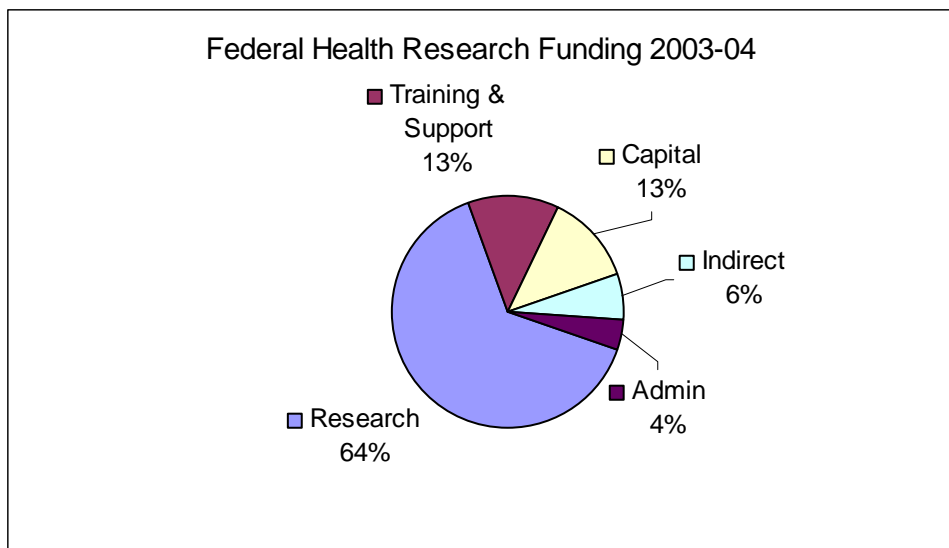


Figure 5

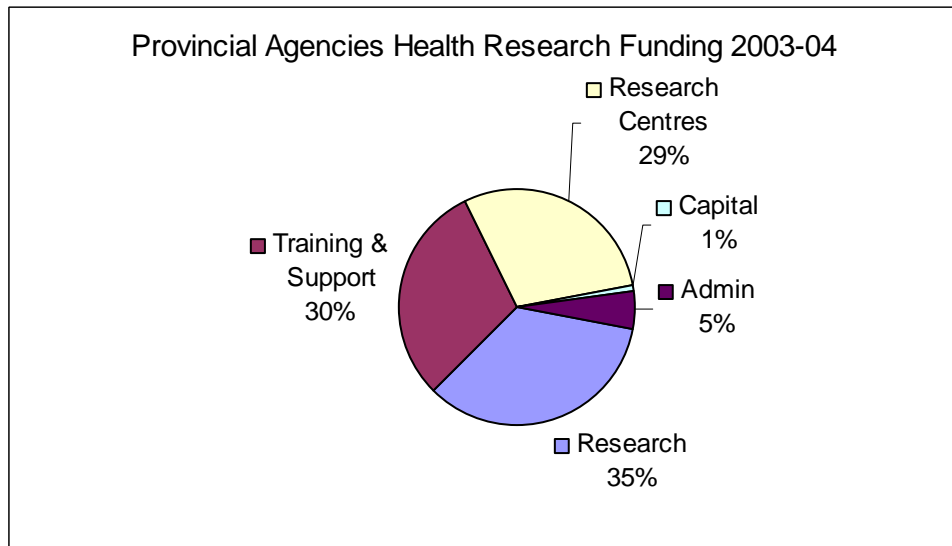


Figure 6

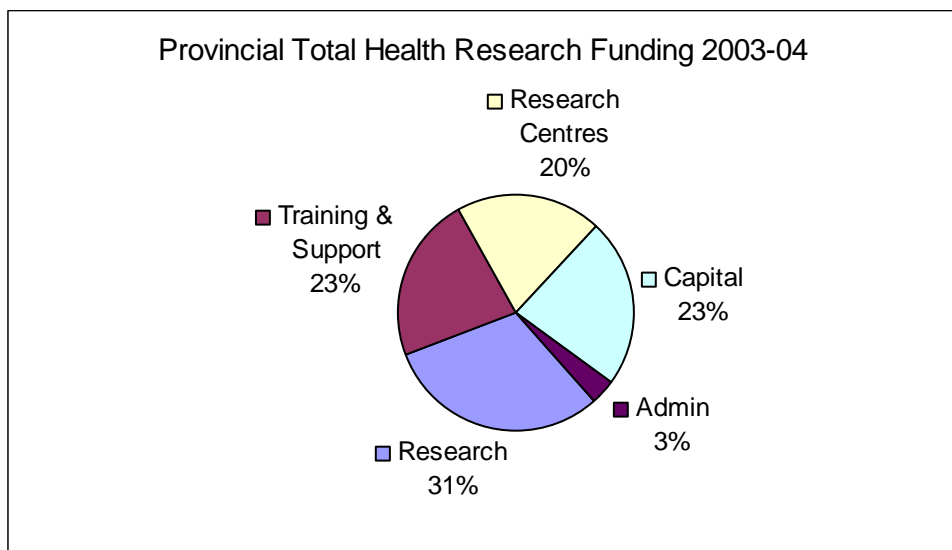
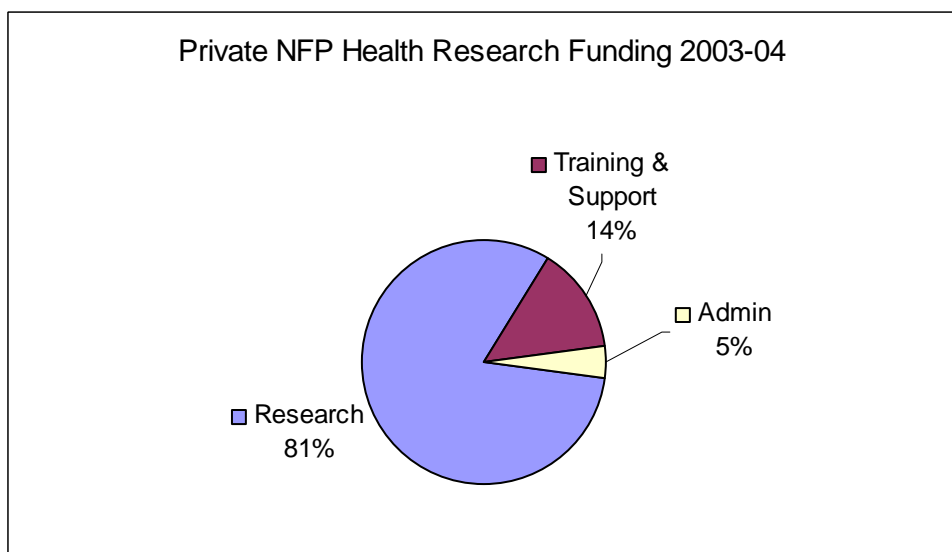


Figure 7



Partner Funding

Partnerships are an important part of the current research funding environment. Partner contributions are cited by many agencies and there is a tendency for each agency in a partnership to characterize its contributions as leveraging funding by the other partners. Estimates of partner funding are shown in Table 5. An attempt was made to avoid double counting of estimates for other funding sectors included in these estimates. An exception was made in the case of provincial co-funding in order to show estimates of the magnitude of provincial co-funding for federal investments. SSHRC and CHSRF also reported partner funding, but estimates were not included here because the level of detail made it difficult to identify health projects (SSHRC) or to identify the contributions of specific funding sectors (CHSRF).

Partner funding by industry and institutions totaled \$174 million (this includes institutions' co-funding for CFI investments, which includes amounts raised from a variety of sources). In-kind contributions are included where they are part of co-funding agreements. In-kind contributions are governed by a set of common standards in the case of federal funding organizations. They are an important component of co-funding by institutions and industry.

The category, other sources, in Table 5 includes federal departments other than the funding agencies shown explicitly in this report, foreign sources and amounts that could not be allocated to specific sources. Consequently there is a small possibility of double counting in the other sources estimate. Where co-funding is not governed by agreements, agencies do not always report or keep records of partner funding, and therefore the estimates are incomplete.

Table 5
Partner Co-Funding - 2003-04 (\$000)

FEDERAL AGENCY OR ORGANIZATION	PARTNER SECTOR		
	Provincial	Institutional & Industry	Other Sources
CIHR		29,240	15,480
NSERC		19,765	
Genome	25,839	29,715	10,336
CFI	104,574	85,560	
NCE	2,748	9,791	6,550
NRC			6,339
Total	133,161	174,071	38,705

Notes:

1. The Provincial column in Table 5 breaks down the Other Provincial estimate in Table 3. Provincial research funding agencies are not included.
2. Amounts reported for CIHR and NSERC are for industry and international partners. NFP, other federal and provincial partners are excluded to avoid double counting of estimates for agencies reported in Tables 2, 3 and 4.
3. Genome, CFI and NCE estimates pro-rate total partner contributions to derive an estimate of the health share. The CFI estimates are based on 60% project co-funding, with approximately 55% of co-funding provided by provinces and 45% provided by institutions that receive CFI grants.

Reconciliation of Estimates with Other Sources of Information

All the estimates in this report have been collected through interviews with agencies, a review of agency annual reports, websites and annual reports to Canada Revenue Agency for certain charities. Statistics Canada's (STC) *Science Statistics* series^{vi} and the Association of Faculties of Medicine of Canada (AFMC) publish annual estimates of health research funding.^{vii} There are a number of circumstances unique to each source of information that affect the comprehensiveness of the estimates and the allocation of amounts to specific funding sectors. Table 6 provides a reconciliation of amounts that would be expected to be reported by all three sources. Important considerations are:

- In addition to the funding sources shown in Table 6, STC publishes estimates of funding by the higher education sector, private industry and foreign sources. AFMC also includes estimates of funding from these three sources, including a finer breakdown of university sources.

- Statistics Canada surveys the federal government, private not for profit research institutions, selected provincial governments and business enterprises. The federal surveys provide information on research carried out by government departments (intramural research) and research carried out by other sectors and funded by the federal government (extramural research). Provincial government surveys cover research funded by provincial governments. Surveys of not for profit research institutions and business enterprises provide information on research carried out by those sectors, including information on the sectors that funded the research. STC has a formula to estimate funding of research in the higher education sector.
- STC surveys tend to lag the most recent expenditure estimates by about two years. More recent data are forecasts. In the 2005 expenditure estimates, federal estimates for 2001-02 and 2002-03 were revised upward by approximately 20%. Similar revisions occurred in the 2004 publication. It seems reasonable to anticipate that the federal 2003-04 estimates might be revised upward next year.
- AFMC data are limited to medical universities and allied health faculties.
- Genome Canada funding and provincial partner co-funding for regional Genome centres are included with the private NFP sector by both STC and AFMC. Genome Canada is included with the federal sector and provincial co-funding is included in the provincial sector in this report.
- Local sources as defined by AFMC would likely include institutional co-funding for CFI and Genome projects. These amounts are probably included in the NFP or Higher Education sector in the STC series.

Table 6
Reconciliation of Health Research Expenditure Estimates
for Selected Funding Sectors - Fiscal 2003-04

Funding Sector	EXPENDITURE ESTIMATES BY SOURCE OF DATA (\$MILLIONS)		
	This report	STC	AFMC
Federal	1,258	1,101	756
Provincial	467	358	438
Private NFP	186	455	239
Local Sources	92		273
Sub-Total	2,003	1,914	1,706

Notes:

1. Genome Canada and regional Genome Centres are categorized as Private NFP in both the STC and AFMC estimates
2. Local sources would be expected to be categorized as NFP by STC. Estimates of local sources in the column labeled 'This report' include institutional co-funding for CFI and Genome Canada.
3. In addition to the sources shown in Table 6, STC and AFMC also publish estimates for university, private industry and foreign sources.

Section 2:

DEMAND FOR HEALTH RESEARCH AND FUTURE FUNDING REQUIREMENTS

Conceptual Model

This section examines future requirements for health research funding. The conceptual model guiding the approach defines requirements for health research funding from a policy perspective as well as a conventional economic view of demand. A policy-oriented perspective on the demand for health research, illustrated on the following page, identifies demand drivers, dimensions of demand and receptors or agents who express demand.

In economic terms the demand for health research is a derived demand since effective health care and health systems require information from research. *Demand drivers* are the exogenous factors that influence the demand for health research.

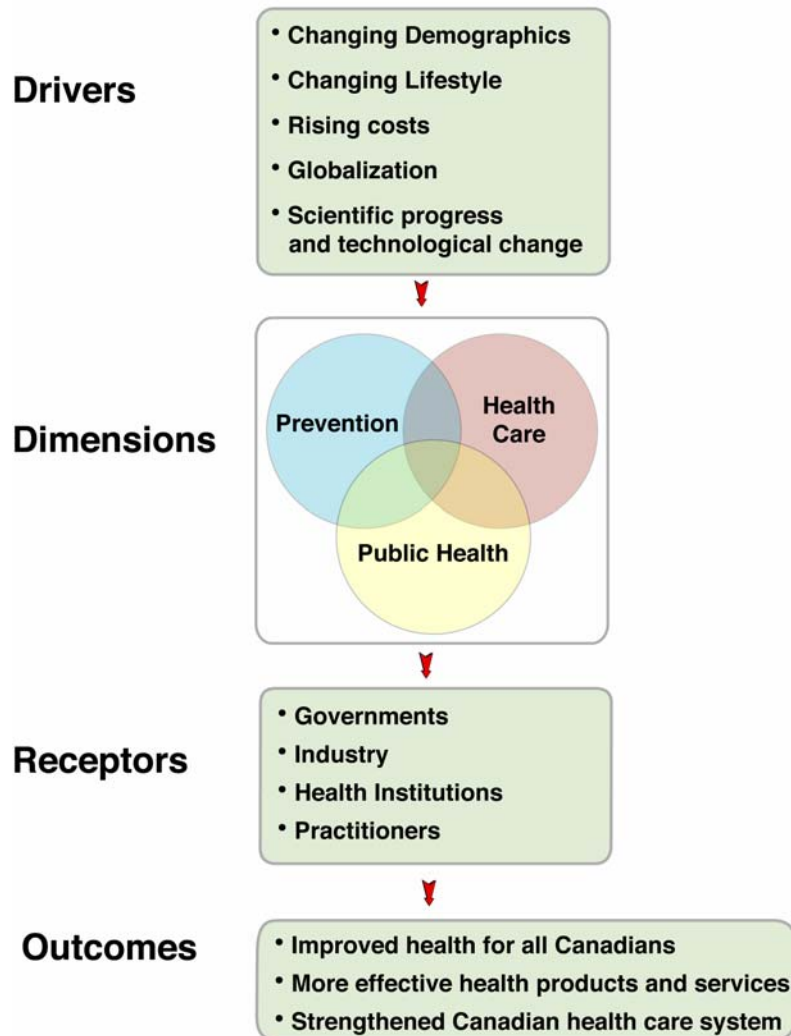
- Changing demographics and lifestyles affect society's health needs and priorities.
- Rising costs of health care are seen by many as a threat to the viability of Canada's health care model, leading to an increased importance of health services research.
- Globalization and international travel can result in rapid transmission of diseases, requiring research to combat the threat of epidemics or the re-emergence of diseases that were previously thought to be under control.
- Scientific progress and technological change also increase the demand for health research as new frontiers are opened in terms of the possibility of health improvements.

Prevention, health care and public health are the *dimensions of demand*. Quality of life is directly affected by all three dimensions.

Receptors in the policy model correspond to sources of demand in economic terms. They are the actors who convert the multiple influences that affect demand into a willingness to pay the costs of health preservation and improvement. The willingness to fund research flows from the understanding that research leads to better health and treatment as well as gains in the effectiveness and efficiency of the health system. In this model the main sources of demand are:

- Governments, which fund health care, set policy and act as managers of health services and public health systems.
- Health care providers, including institutions and practitioners.
- Industry, which treats research information as intermediate goods to be used in the production of health commodities.
- The general public, which expresses societal priorities for health improvements made possible through research.

Health Research Demand Model



Funding Health Research

Research funding provides a mechanism for society to express effective demand for health research. Most health research produces public goods, which are defined as commodities that are not paid for directly by consumers and cannot be sold in markets. Examples from research would be knowledge about the beneficial effects of lifestyle choices, or new surgical treatments in publicly owned health care systems. Much research is curiosity driven, consisting of basic research that builds new knowledge incrementally over time, without the prospect of immediate impact on society or the economy.

This type of research requires funding from the public and philanthropic sectors. Individuals cannot purchase health research, although they can support government research funding and personally donate to research funding charities.

Private markets for research are only viable in industries where R&D for product development is a cost of business (drugs, devices, etc.). Otherwise research is a public good.

A second purpose of research funding is to provide educational assistance to students and support for researchers (set-up and operating costs, and salary off-sets). Set-up and operating costs for researchers are conceptually similar to start up costs for a private sector employer. Even in the private sector, training is often provided at public expense or at the expense of students.

Future Demand and Funding Requirements

The classic determinants of demand for health are income, education and affordability. The Canadian public is well aware of the importance of health research and opinion surveys show high levels of support for increased health research funding. Economic growth and increasing levels of education suggest that demand for health research will continue to be a priority for the public. Estimates of future funding requirements in this section are based on the assumptions below. Future estimates draw on trends in CIHR grant funding and growth of researchers who look to CIHR for financial support.

Assumptions in Estimating Funding Requirements:

1. Demand for health research from the general public will increase so long as there is a perception that health benefits will be realized.
2. Public policy will reflect population priorities for health research, subject to budget constraints.
3. Increases in the capacity to do health research will create increased requirements for health research funding.
4. The possibility of substitution between funding sources is limited.

CIHR Research Grant Funding

CIHR's research grant portfolio represented 68.5% of total CIHR expenditure in 2004-05 (Figure 8). The \$516 million total includes approximately \$108 million in strategic research grants administered by the 13 CIHR institutes (the \$13 million for Institutes in Figure 8 is the cost of support grants for each institute). CIHR grants and the number of co-investigators participating in grants have increased steadily since CIHR came into existence in June 2000 (Figure 9). The largest increase occurred in 2001-02, the first full year of CIHR's operation. Increases during the next two years were affected both by increased funding from the federal government and an increase in the ability of CIHR, as a new organization, to expand its grants portfolio. In 2004-05, rates of increase for both grants and investigators participating in grants dropped to approximately 2.5% from approximately 8% in the previous year.

Figure 8

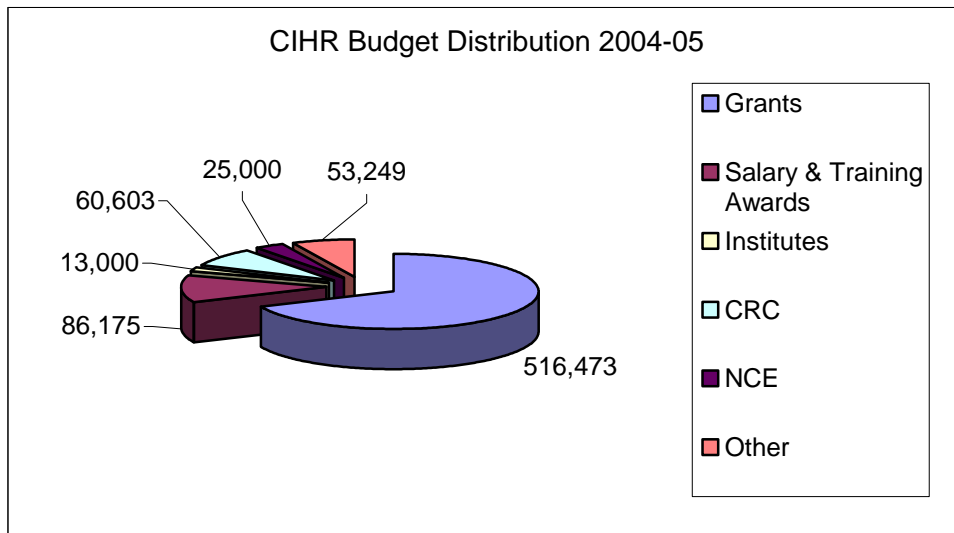
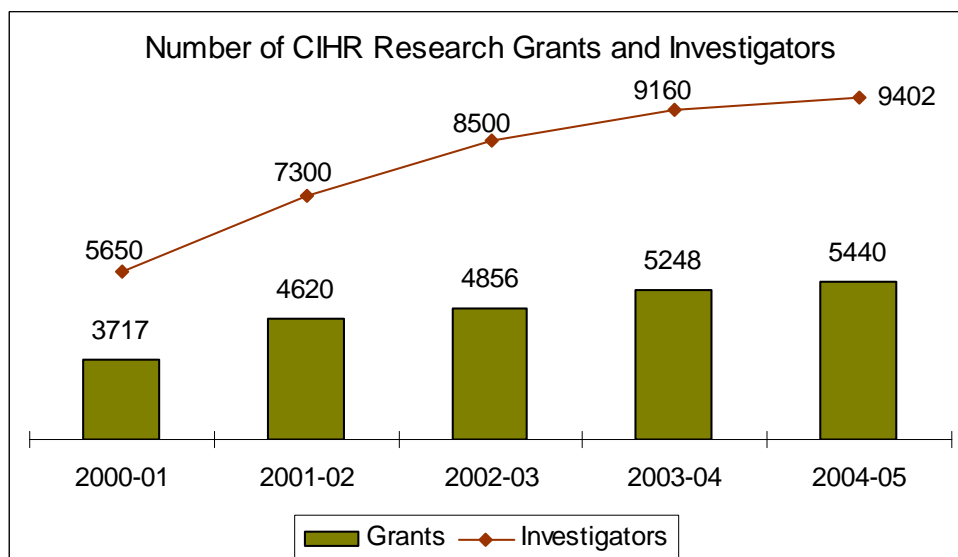


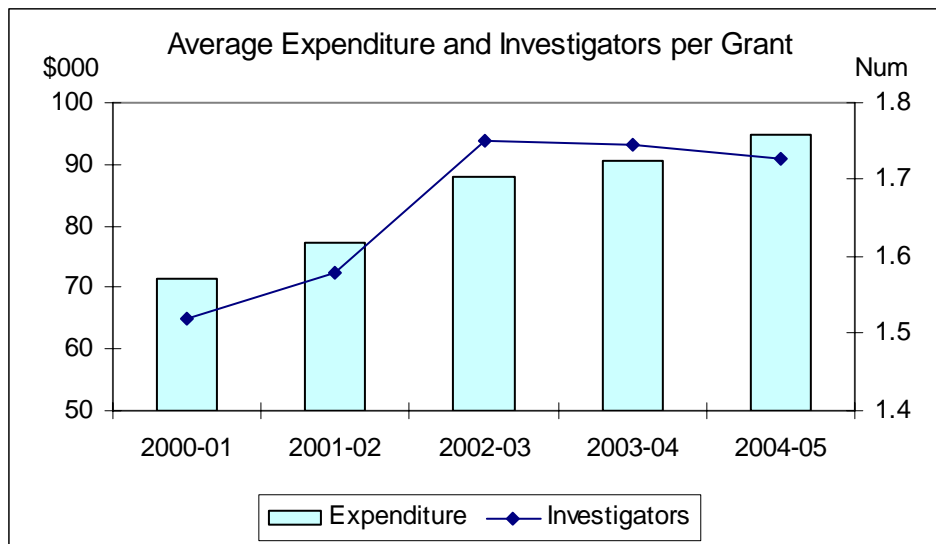
Figure 9



While overall trends suggest a leveling of grant support by CIHR, a closer examination shows that both average expenditure and investigators per grant have been increasing. Expenditure per grant was approximately \$94,900 in 2004-05 and \$77,200 in fiscal 2001-02⁴ (Figure 10). This trend is due in part to a tendency for grant applications to involve collaborative projects with multiple investigators and research sites, and in part to inflation in research costs.

⁴ Expenditure per grant is the average annual value. Many grants extend over a number of years and therefore total value per grant would exceed average annual expenditure per grant.

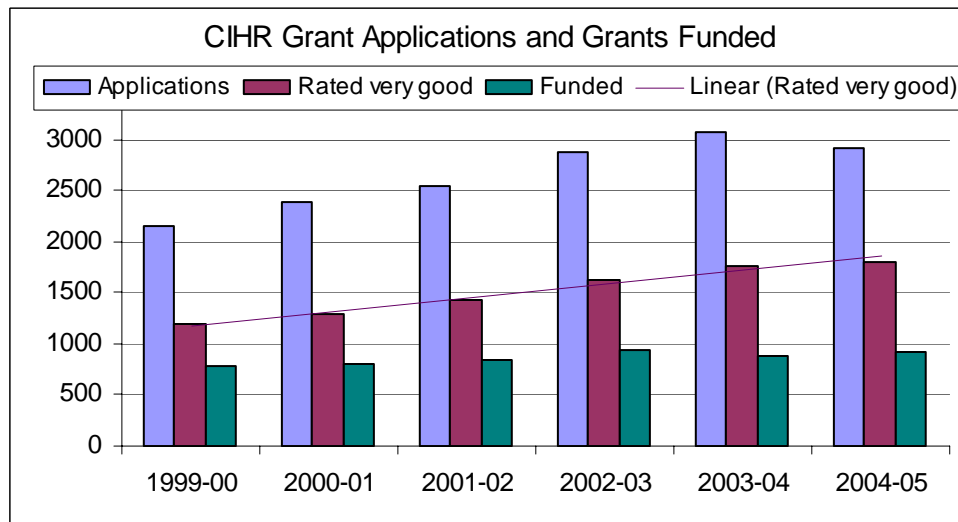
Figure 10



Grant Applications

The total number of grant applications to CIHR's Open Grants Program and the number that receive very good scores (3.5 or higher) in peer reviews have been increasing steadily.⁵ The number funded has grown more slowly and as a result, the percentage of grant applications rated very good that are funded has decreased from 62% in 2001-02 to 50% in 2004-05. When funded projects are compared to total applications, the success rate dropped from 33% in 2001-02 to 31% in 2004-05. The success rate continued to drop in 2005, with rates of 28% in the June 2005 competition and 25% in the September competition.

Figure 11



⁵ Trends in 2004-05 should be viewed in context with the fact that new restrictions were implemented limiting grant applications to one new application per investigator. The number of grants in Figure 11 does not include strategic initiatives, which are included in Figures 9 and 10.

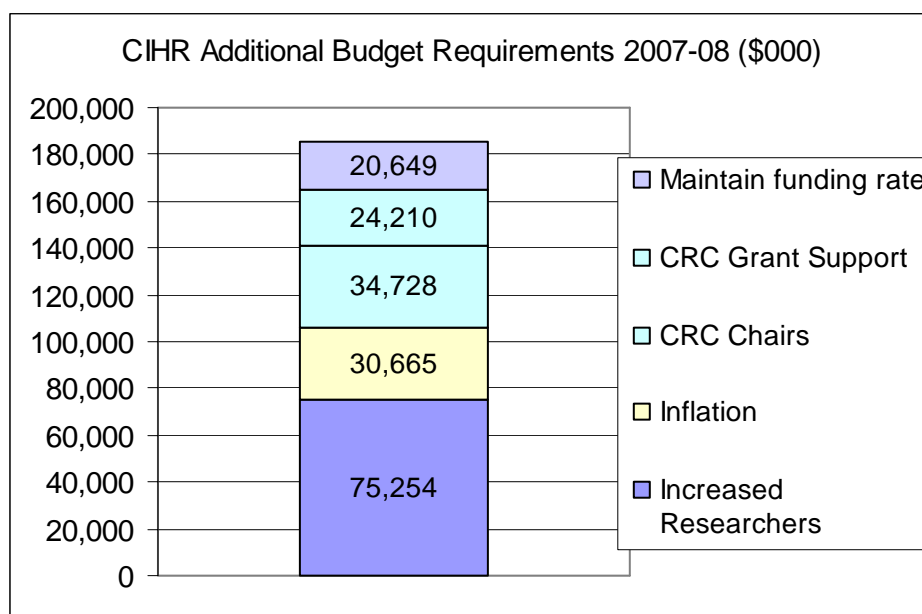
Trends during the first five years of CIHR support the following conclusions:

- The CIHR community of researchers has been generating an increasing number of high quality applications for grant funding.
- Despite cumulative CIHR budget increases totaling 45% during the last four years, the number and percentage of qualifying but unfunded grants has increased.

Estimates of Future Grant Funding Requirements

This section examines indicators that can be used to estimate research funding requirements over the next three years. The focus is on research grants. Other CIHR expenditures are assumed to remain constant – a simplifying assumption adopted with a view to forecasting funding requirements that result from an increasing demand for health research. The indicators used in the projections consist of (1) growth in the number of researchers who depend on CIHR for support, (2) growth in the number of funded Canada Research Chairs and their effect on grant funding, (3) inflation in the average cost of research grants and (4) a target of a 62% rate of funding applications that pass peer review with very good ratings. The budget implications in 2007-08 of each of these factors are shown in Figure 12.

Figure 12



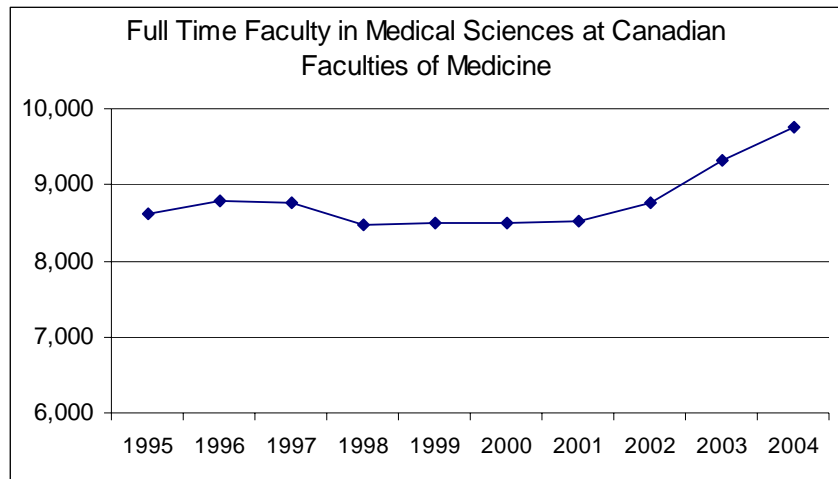
Increasing Number of Researchers

Medical Sciences faculty in Canadian universities represent a large proportion of total researchers funded by CIHR. The most comprehensive source of data on medical sciences faculty is the Association of Faculties of Medicine in Canada (AFMC), which publishes annual data from each of the 16 Canadian medical universities.^{viii} The AFMC data show a rapidly increasing number of full-time faculty since 2001 (Figure 13). The data in some years are affected by changing definitions of full-time status in some universities, but nevertheless the trend since 2001 seems unequivocal in terms of direction. During the three years from 2001 to 2004 the number of full time faculty increased from 8,770 to 9,758, or 14.6%.

Between 2002 and 2004 there was a close correspondence between the growth of full-time faculty and the growth of researchers funded by CIHR research grants the following year (Figure 14). It seems reasonable to conclude that there is a cause and effect relationship, with a growing numbers of

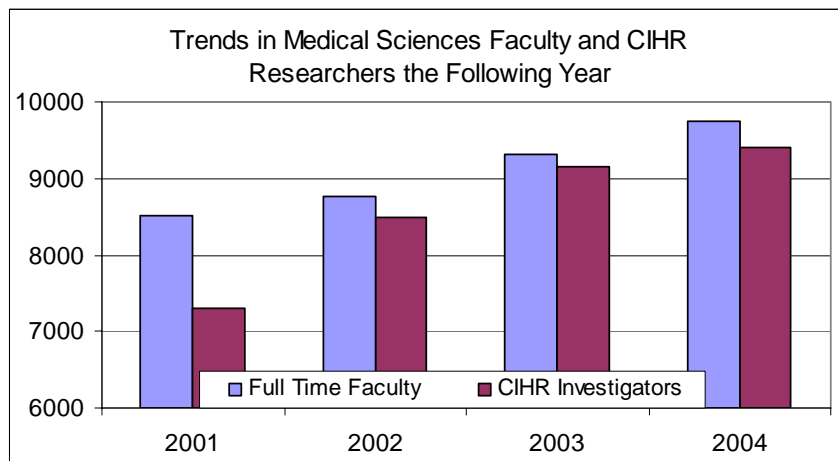
researchers generating an increasing number of research grant applications. The other side of the coin is the fact that research funding is an incentive in recruitment of faculty. This correspondence suggests that rates of increase in medical sciences faculty can be used as a proxy to predict increases in requirements for CIHR grant funding.⁶

Figure 13



Source: Association of Faculties of Medicine in Canada. See notes to Figure 15.

Figure 14



Source: Association of Faculties of Medicine in Canada and CIHR

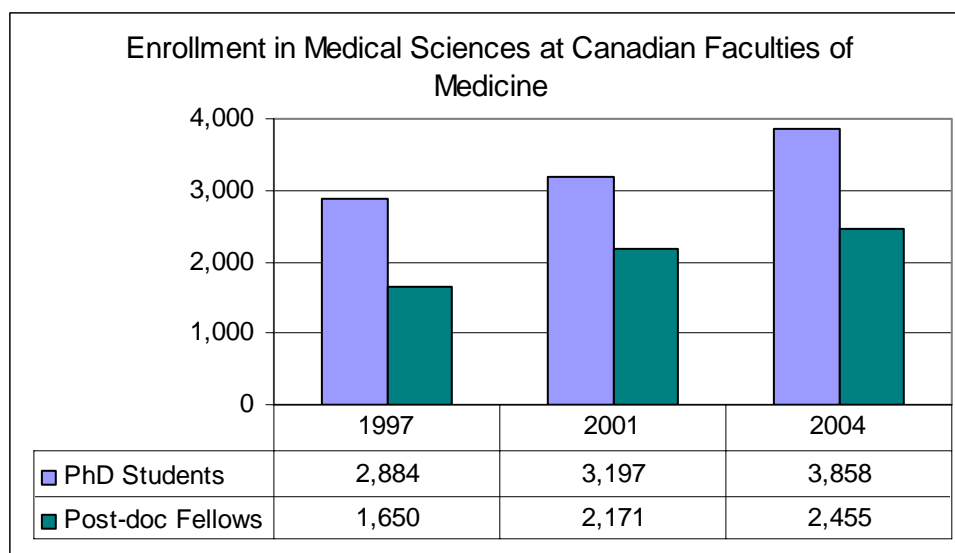
While full-time university faculty represent a substantial proportion of CIHR researchers, the Canadian research community includes researchers who are employed in research hospitals or other institutions. While there are no comprehensive estimates of the total number of researchers engaged in health research, trends in the number of researchers presently in training can be used as a source to estimate future increases in health researchers, either as faculty members or as scientists in other research

⁶ It is important to note that researchers supported by CIHR are not limited to members of medical sciences faculties. Nevertheless, the similarity of trend data suggest that trends in medical sciences faculty can be used to estimate future trends in applications for research grants.



venues. AFMC data on number of PhD students and post-doctoral fellows show a trend of strong increases since 2001 (Figure 15).

Figure 15



Notes: AFMC advises that data on enrollment are more consistent than data on full time faculty, due to changing definitions of full time in certain universities. A portion of the large increase in post-doc fellows from 1997 to 2001 is due to improved data collection at one university.

Source: Association of Faculties of Medicine in Canada.

The first component in the estimates of funding requirements in fiscal 2007-08, growth in researchers, assumes that the applications for CIHR grant support will parallel the growth in researchers between 2004 and 2007. Table 7 assumes a growth rate of 14.6% in the number of researchers between 2004 and 2007, the same rate of growth observed for full time faculty over the preceding three years. The first assumption is possibly conservative, in light of the trends in PhD graduates and post-doctoral fellows, who would be the most likely domestic source of new faculty:

- There were 1,589 PhD graduates between 2001 and 2004.
- There were 3,858 PhD students and 2,455 post-doctoral fellows in 2004, representing increases of 21% and 13% respectively over their numbers in 2001.

The table also assumes the average rate of CIHR funding per investigator will stay constant, except for the effects of general inflation, which are estimated separately.

Table 7
Potential Increase in CIHR Grant Expenditure to Maintain Support for Increases
in Researchers 2004-05 to 2007-08

	FACULTY	CIHR RESEARCHERS	CIHR GRANTS
2004	9,758	9,402	5,440
2007	11,180	10,772	6,233
Increase	1,422	1,370	793
Increase in grant expenditure (000)			\$75,254

Canada Research Chairs

CIHR has been allotted 35% of Chairs under the CRC program. As of March 2004, 445 of the CIHR chairs had been filled. By October 2005 the number of active CIHR Chairs had increased to 541, with the full complement of 700 expected to be filled by 2008. The table below shows that direct funding required for additional CIHR Chairs will increase by approximately \$35 million, based on experience to date. Changes in the balance between Tier 1 and Tier 2 chairs could affect the projections, since Tier 1 funding is \$200,000 per year and Tier 2 funding is \$100,000 per year.

Table 8
Number of Canada Research Chairs Allocated to CIHR

FISCAL YEAR	NUMBER OF CIHR CHAIRS	CRC ANNUAL EXPENDITURE (\$000)	EXPENDITURE PER CHAIR (\$000)
2004-05	445	\$60,603	\$136
2007-08	700	\$95,330	\$136
Increased direct funding		\$34,727	

Direct funding for Chairs is provided to CIHR and the other two federal granting agencies by the CRC program. CRC funding is allocated to institutions that employ chairholders. CFI provides infrastructure grants to institutions based on their number of active chairs. Chairs generate research proposals and the available evidence suggests that they are very successful in obtaining funding – an evaluation of the Chairs program in 2004 found that CIHR chairholders increased their research grant funding at rates of 84% (Tier 1) and 105% (Tier 2) between 1999-2000 and 2002-03 compared to 22% for other researchers.^{ix} The average amount of research funding for chairholders was double the average for non-chairholders.^x As of March 2005, 31% of Chairs were recruited from outside Canada.

These evaluations suggest that additions to the number of CIHR chairholders will translate into increased requirements for CIHR grant funding. The CRC Steering Committee is considering an option to include a research operating grant as part of the CRC package for future awards. Within the context of these factors, it seems reasonable to estimate that there would be at least a one-to-one correspondence between additional CIHR Chairs and CIHR research funding requirements. This requirement would be valued at approximately \$24 million in 2004-05 dollars, as shown in the next table.

Table 9
Research Grant Requirements – Additional CRC Chairs

	ADDITIONAL CHAIRS	RESEARCH GRANTS PER CHAIR (000)	ADDITIONAL GRANT EXPENDITURE (000)
2007-08	255	\$95	\$24,210

Inflation

The estimates of funding requirements in 2007-08 include inflation in grant costs at a modest rate of 1.5% per year, or 4.6% over the three year period. This assumption may be too conservative in view of the fact that the value of funded grants per investigator has increased by 12.5% since 2001-02 (from \$48,833 to \$54,932).

Maintain Funding Rate

Achieving a funding rate of 62% of applications rated very good would have resulted in an additional 218 grants in 2004-05. Based on that year's average value per grant, an additional expenditure of \$20.6 million would have been required. The estimate is conservative. The number of additional grants in 2007-08 would be expected to be higher, based on expectations of increases in the number of very good applications and on the carry-over of some grants from previous years.

Discussion

The calculations presented above are speculative but they seem reasonable as an approximation of funding requirements looking ahead three years. They start from the assumption that the requirement for CIHR support will increase in proportion to the pool of health researchers. This assumption has been shown to be accurate during the last three years of CIHR's grant funding, following a marked increase in CIHR's second year.

Funding requirements are defined as maintaining a level of grant support at least equivalent to the level of support in 2004-05, and increasing the funding rate for Open Grant applications rated very good to 62%. In this context, requirements are simply a mathematical concept and do not imply an opinion about the merits of maintaining, increasing or decreasing support.

Taken together, these simulations assume additions to CIHR's annual grant budget that will total \$155 million by 2007-08, in 2004-05 dollars. Inflation, using a modest estimate of 1.5% per year, will bring the total to \$185.5 million. The CRC Chairs program will fund the estimated direct cost of additional CIHR Chairs. Subtracting this amount leaves approximately \$150 million in additional budget requirements to maintain grant support.

Other Indicators of Demand for Health Research and Funding Requirements

The indicators used to develop the estimates above (CIHR grant trends and trends in medical sciences faculty, PhDs and post-doctoral fellows) have three advantages: they are current, they are drawn from sources that provide comprehensive data with relatively stable reporting standards and they avoid double counting. These indicators show a rapidly increasing pool of health researchers, which in itself points to the success of policies implemented in the late 1990s to improve Canada's research capacity.

Other indicators confirm these trends. Some of the main findings and projections from other stakeholders are summarized below. Indicators from other programs are not additive to each other or to the data presented above, however, since researchers often participate in several programs that carry out or support research.

Indicators of Increasing Research Capacity

The Association of Universities and Colleges of Canada (AUCC) reports that faculty members in Canadian universities increased by 4,000 between 1997 and 2004. Student enrollment grew by 200,000 during this same period. In view of these trends, AUCC predicts that faculty may have to increase by as much as an additional 17,000 by 2011 (from 38,000 to 55,000).^{xi}

A 2004 evaluation of the *CRC program* found that between 1999-00 and 2002-03 there was:

- An increase of 2,816 researchers (937 for CIHR Chairs) working in research centres with which the chairholders were associated.
- An additional 779 doctoral students and 490 post-doctoral students were supervised by chairholders.

The *Networks of Centres of Excellence (NCE)* program reported an increase of 297 PhD students (from 264 to 561) and 367 Masters students (from 183 to 550) involved in participating Networks in the theme area of health, human development and biotechnology between 2000 and 2004.^{xii} Rates of increase in this theme area were greater than in any of the three other theme areas.

CFI reports^{xiii}

- 3,170 new faculty members were recruited in Canadian Universities and 4,104 were retained in 2003-04 with the assistance of CFI infrastructure projects.
- 20,481 academic researchers have used CFI projects to advance their research, 39% of whom were from an institution other than the one housing the project. In addition, 3,696 researchers from outside Canada participated.

Genome Canada reports that projects it has sponsored have attracted 85 researchers to settle in Canada, trained 1,278 researchers and created 1,818 jobs since the program was launched in 2000.^{xiv}

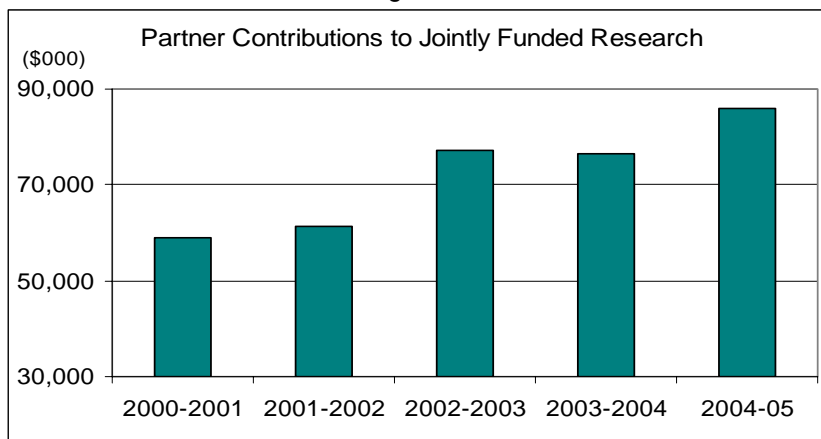
CIHR training awards supported 1,422 students, 768 fellowships and 456 new investigators in 2004-05.^{xv}

Partnerships

Collaboration and partnerships are major objectives of CIHR. Collaboration within the CIHR research community is evident in a number of multi-disciplinary research initiatives. In terms of grant funding, the increase in the average number of investigators per grant since 2000-01 is evidence of increasing collaboration.

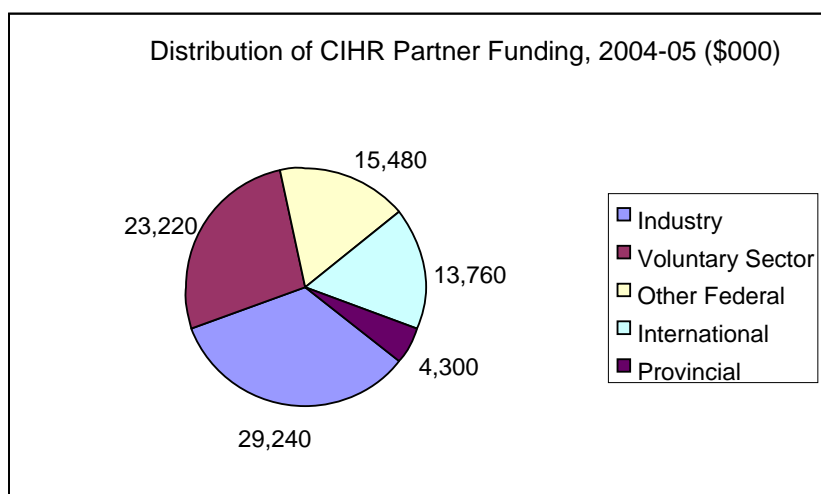
In partnerships with other agencies, CIHR is most often the senior agency in terms of funding capacity. CIHR partner contributions to jointly funded research were \$88 million in 2004-05, equivalent to 12.4% of combined grants and awards. Industry provided approximately 34% of partner funding, with a substantial portion of this amount allocated to awards such as joint CIHR and industry research chairs. Private NFP organizations provided 27% of total partnership funds. The remaining amounts of partner funding were provided by other federal agencies, international agencies and provincial funding agencies. The prospect for significant increases in partner funding is limited in sectors other than industry by constraints dictated by government budgets and the ability to raise funds in the voluntary sector.

Figure 16



Source: CIHR

Figure 17



Source: CIHR

Federal funding programs that require or attract substantial partner contributions consist of CFI, Genome and NCE. CFI funding covers 40% of project costs, except for the Infrastructure Operating Fund, which provides funding for infrastructure maintenance without the necessity of co-funding. On average, provincial governments cover 33% of CFI project costs while the institutions that receive infrastructure grants are responsible for the remaining 27% (including cash and in-kind contributions). Genome Canada projects require at least 50% co-funding, although Genome also has substantial investments in research platforms that support many projects. As of March 2005, Genome Canada and partner contributions represented a split of 51% to 49% of investments totaling approximately \$1 billion.^{xvi} Some new Genome projects have as much as 75% partner funding.^{xvii} NCE federal expenditures were \$77.4 million in 2004-05. Partner contributions were \$71.6 million, of which \$37.4 million was in the form of cash and \$36.2 million was the value of in-kind contributions.^{xviii}

Table 10 shows the percentage distribution of partner contributions for CIHR, Genome and NCE. Industry provides 34% to 40% for CIHR and NCE projects. Provinces account for almost 40% of Genome Canada partner funding, reflecting perhaps the large investments in regional genome centres. Differences in the funding models of CIHR and the other two agencies explain the lack of university contributions and the importance of NFP contributions in CIHR partner funding. University researchers are recipients of CIHR



grants and awards and are not required to provide evidence of co-funding or in-kind support. NFP funders concentrate their resources in grants and awards, which explains why they are not shown as partners in the other two programs.

Table 10
Distribution of Partner Funding by Source 2004-05

SOURCE	CIHR	NCE	GENOME CANADA
Industry	34.0%	39.9%	21.6%
Federal	18.0%	19.7%	13.7%
Provincial	5.0%	14.2%	39.2%
University / Institutions		9.0%	9.8%
Private NFP	27.0%		
International and Other Sources	16.0%	17.2%	15.7%
Total	100%	100%	100%

Expert Opinions about Trends in Research Funding Requirements

All agencies and organizations interviewed for this project were asked to comment on trends in the demand for health research and strategies to deal with increased funding requirements. This section summarizes responses to these questions. The first part provides a synthesis of comments from federal agencies, followed by comments from provincial and NFP agencies.

Federal Agencies

SSHRC has experienced steady increases in the number of applications for grant funding. The number of applications from new researchers is increasing more rapidly than applications from existing researchers. Peer reviewers in SSHRC's core program - the Standard Research Grants - recommend approx. 70% of applications but SSHRC is able to fund only 40%. This pressure alone has several implications for SSHRC including: (1) that resources must increase to keep up with demand; (2) that grants will be smaller in future; or (3) that success rates and/or funding rates will need to be adjusted accordingly.

NSERC is experiencing the highest rates of growth in researchers that it has ever seen. About 800 to 1,000 new researchers apply for funding each year. This trend holds for health related areas as well as science and engineering.

NCE is experiencing an increase in the number of proposals for new networks. Increases in the number of students participating in NCE projects have been impressive but more faculty are required to support continued increases in students. Expectations are being raised in the research community, but it is not clear that they can be met in future.

Commercialization of intellectual property is an important objective of the research effort in Canada. Private sector partnerships are welcomed by the granting agencies. Experts in the federal granting agencies were unanimous, however, in thinking that there were limits to the extent to which commercialization and private sector participation would be able to support growth in research capacity. Returns from commercialization are usually received by patent holding researchers or institutions and it is not clear how much of these returns are reinvested in additional research. Private sector participation

tends to be concentrated in certain types of research and does not offer the prospect of replacing public sector funding for basic research.

The National Research Council and Genome Canada have an entrepreneurial outlook for some of their investments. Both Genome and NRC view revenues and partnership funding as mechanisms to fund growth and all revenues generated in both organizations remain with the regional centres or institutes where they originated. Federal funding is viewed as core funding and there is no prospect of replacing it with internally generated revenues or investments from other sources.

The CRC program Steering Committee is concerned about the adequacy of CRC grants. Chairholders have complained about difficulty in obtaining research funding from granting agencies, but investigations have not supported the validity of this complaint. Other issues include a possible expansion of the number of chairs – possibly targeted to national priorities.

The Indirect Costs program has found that university costs are increasing more rapidly than program funding. The program covered 26% of eligible university costs at its inception. This percentage has dropped to approx. 23% at present. Universities argue it should cover 40% to 50%. Some NFP funders believe that they are at a disadvantage in attracting the best research proposals since universities try to steer researchers to the three granting agencies in order to increase their share of the Indirect Costs program budget. (There is also a misperception that a grant funded by one of the three agencies automatically includes a top-up from the Indirect Costs program).⁷

Provincial Agencies

Provincial funding agencies interviewed reported increasing pressure for funding. Most find that the proportion of acceptable grants they can fund has been dropping. At the same time, the quality of grant applications is increasing.

Expansion of medical universities was cited as a factor in the increasing requirements for health research funding. Increases in faculty required by increased enrollment in medical training programs lead to increased requirements for research grant and career award funding in order to maintain a balance between teaching and research that will be attractive to new faculty. One provincial agency director suggested that mentoring is becoming a problem as the ratio of new to established researchers changes. The requirement for research in policy relevant areas is also increasing. Provinces that support research centres see these centres as playing a key role in the development of policy and evidence to support their health systems. One province reported that there is increasing pressure to align research funding with provincial priorities and as a result it is difficult to continue to provide funding for curiosity-driven research.

Provincial agencies also provide support to provincial researchers in their efforts to obtain funding from the federal granting agencies. There appear to be no instances where provincial agencies see their role as substituting for the federal granting agencies in supporting future requirements for research funding.

One provincial agency director suggested that increasing participation in international research may be a strategy to deal with increasing demand. NIH could be a promising source of funding for Canadian researchers. This suggestion should be viewed in context with the fact that NIH presently funds approximately \$100 million for Canadian health research (2004).^{xix} The NIH budget proposed for the fiscal year beginning October 2005 provided only 0.5% in new funding.^{xx}

⁷ Institutions share the available Indirect Costs program budget based on three-year averages of grants from the three granting agencies. Additional grants have the potential to increase an institution's share, but there is no direct top-up of grant funding with Indirect Costs funding.



NFP Sector

In the NFP sector, the Health Charities Coalition of Canada (HCCC) suggested that hospice and palliative care will become larger research issues in the future. Many charities change their themes and priorities over time.

Both the National Cancer Institute of Canada (NCIC) and the Heart & Stroke Foundation (HSF), the two largest NFP funders, reported that demand for funding has increased during the last 10 years. HSF reports that the cut-off score for grant funding has been increased from 3.5 to 3.8 due to increased demand for funding. The quality of research proposals has also increased, with a larger percentage now exceeding the funding-quality threshold. This is due to genuine increases in the quality of proposals, but NCIC has found that it is also influenced by 'reviewer creep' – a tendency to score proposals higher over time.

One agency reported that the number of applications is relatively stable from year-to-year but average grant size is increasing. Another agency expressed a unique view: in disease based research, the researcher community tends to follow the money. If there is insufficient funding for one disease area, researchers will move into different areas. This is a different situation than the one faced by granting agencies, which fund all types of medical research.

NFP agencies often have competing demands for activities other than research support, including public education and support for persons who suffer from target diseases. In addition, the competition for charitable donations is increasing. These factors limit the ability of charities to increase research funding activities.

Conclusions

Experts in health research funding agree that research funding requirements are increasing apace with the growth in the importance of the health sector and the growth in health researchers. Growth in demand for research is evident in the natural and social sciences as well as in health. Much of this growth is due to an increased national emphasis on a knowledge based society. Policies to expand university enrollment and research capacity have been successful. Investments in both human capital and infrastructure have led to a rapid expansion of research capacity. Increasingly, the focus is shifting to the future sustainability of funding for higher education and research.

While there is a potential to commercialize intellectual property and to attract additional investments from industry, these potentials tend to be concentrated in certain types of research and they do not offer the prospect of replacing public sector funding for basic research.

The challenge for federal funding agencies will be to develop innovative and relevant funding models to increase the impact of research on society, while maintaining commitments to support curiosity driven research and meet reasonable expectations for funding from an expanding research community.



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