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A Framework for Enhanced Estimations of Higher Education and Health R&D Expenditures

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A Framework for Enhanced Estimations of Higher Education and Health R&D Expenditures

Final Report of Statistics Canada's Working Group on Higher Education and Health R&D Expenditures

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Report prepared for the Science, Innovation and Electronic Information Division

ST-00-03

Introduction

In the spring of 1999, the Science, Innovation and Electronic Division of Statistics Canada decided to review the methods it uses to estimate Higher Education R&D Expenditures (HERD) and Health Gross Expenditures on R&D (Health GERD). The manner in which research is performed and funded in Canadian universities and research hospitals has evolved in recent years, and current methodologies may not take these changes into account. Also, by improving HERD, the health GERD estimates will also benefit. And it may be possible to improve them yet again by building upon recent work in Statistics Canada on biotechnology R&D in Canadian Industry.

It is timely for Statistics Canada to review its estimates of HERD and Health R&D. First, the Strategic Plan of SIEID recognizes the need for improved indicators of R&D, innovation, technology diffusion and human resources related to these activities. Second, more and more budget allocation decisions are based on the research performance of higher education institutions (measured in large part by national statistics). Third, with the transition to a knowledge-based economy, the way knowledge is generated has changed; more and more university research is performed outside traditional academic departments in affiliated centres, institutes, or hospitals, often by full time researchers who do not hold a traditional academic appointment and whose research activities may not be fully captured in current data. Finally, the Canadian Institutes of Health Research (CIHR) need good data on health research to develop, implement and assess their policies and programs.

Following an initial study and a positive reaction to its recommendations from a group of professionals in the university and health research fields in September 1999, SIEID created a Working Group and hired a facilitator to examine current estimation methods, to recommend revisions where appropriate, and to produce a framework for an improved program in this area. This document is the final report written by the facilitator, Mireille Brochu.

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Gross expenditures on research and development (GERD)
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Research and development in Canadian Industry
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A Framework for Enhanced Estimations of Higher Education and Health R&D Expenditures

Summary, Recommendations and Conclusion

The Working Group on Higher Education and Health R&D expenditures was created by Statistics Canada as part of its efforts to improve estimates of higher education R&D expenditures (HERD) and health gross expenditures on R&D (health-GERD). The Working Group was asked to develop a framework for improved estimations of HERD and health-GERD. While acknowledging that all parts of this project were closely related and overlapping to a degree, the working group divided the framework into manageable tasks as follows:

1. HERD—Sponsored research
2. HERD—Other costs of research
3. R&D personnel
4. Dissemination of information on higher education R&D and personnel
5. Comparisons with the United States
6. Health GERD.

For each of these tasks, members identified desirable enhancements, and, for each, assigned a priority and indicated whether the enhancement would be easy or difficult to implement and whether it should be undertaken in the short, long or medium term. Statistics Canada estimated the costs of each step.

The Working Group **recommends** that Statistics Canada refine and implement this framework, as summarized below.

For **sponsored research**, the Working Group recommends:

1. that Statistics Canada continue to rely mainly on the annual financial report prepared by Statistics Canada (Centre for Education Statistics) from data collected and provided by the Canadian Association of University Business Officers (CAUBO).

2. that Statistics Canada continue to work closely with CAUBO in its efforts to improve the reporting by universities of financial information, in particular with respect to sponsored research funding.

   In this regard, the CAUBO Finance Committee has agreed to recommend to CAUBO that universities provide more information on what institutions are included in the Financial Report (thus enabling Statistics Canada to know which research hospitals and institutes are included in university reports. The CAUBO Finance Committee has also accepted a recommendation to identify funding from the Canada Foundation of

Innovation as sponsored research. Finally, the CAUBO Finance Committee is also reviewing the guidelines to institutions and working on other improvements to the annual Financial Report of universities.

3. that Statistics Canada continue to estimate sponsored research in three fields, namely health sciences, natural sciences and engineering, social sciences and humanities.

4. that Statistics Canada improve its methods to estimate research by field, by conducting occasional surveys of "typical" universities (via the research office, not the finance office) to obtain estimates of research funding by field.

   The Working Group would have liked to recommend an expansion of CAUBO data to include information by broad discipline and distinction between grants and contracts. The Working Group understands that this is not feasible at this time, but **suggests** that CAUBO and the Association of University and Colleges of Canada (AUCC) consider such changes in the longer term.

Given that community colleges are now doing a significant amount of R&D, the Working Group **suggests** that Statistics Canada start collecting data on college R&D (through financial data on colleges collected by the Centre of Education Statistics) and include them in HERD. This is a suggestion, not a recommendation, as the Working Group did not study this issue in detail.

For HERD (**other costs of research**), the Working Group recommends:

5. that Statistics Canada revise the current method used to estimate costs of research borne by the institutions themselves and replace it by an estimation of indirect costs of research and an estimation of faculty member salaries.

   This method was tested by the Working Group and leads to more reasonable estimates by field and by institution, as it assumes that some of the costs borne by institutions themselves are proportional to sponsored research costs and some are proportional to faculty member salaries. The current algorithm is based exclusively on numbers of faculty members and their "consumption of research resources."

For **R&D personnel**, the Working Group recommends:

6. that Statistics Canada simplify the current methodology to align it more with the new method to estimate HERD-Other costs of research.

7. that R&D personnel be divided into a) faculty members and equivalent; b) graduate students; c) others, and, should this prove feasible in the longer term, d) postdocs.

8. that, to this end, Statistics Canada make use of data from CAUBO (on salaries paid out of sponsored research funds for various categories of personnel), granting

councils (for estimates of proportion of sponsored research funds spent on the various categories of personnel), Centre for Education Statistics (for faculty members and graduate student numbers), and perhaps census.

For **dissemination of information** on higher education R&D and personnel

In the interviews for the HERD study, and in the workshop conducted as part of that study, respondents suggested that there should be an "occasional publication" summarizing the trends in university research, including inputs, outputs and linkages. The Working Group agreed with this suggestion and recommends:

9. that Statistics Canada develop a comprehensive Web site that would include relevant information on inputs, outputs and linkages, including references to various data sets and documents (some of which are published by other organizations).

   Depending on the data set, information should be available at the national, provincial or university level. For example, sponsored research data must be available by university (they are now made available by university by CAUBO), whereas data on R&D personnel could be at the provincial level, given that they rely on many assumptions. Members agreed that minimal analysis would be required, e.g. highlights, or a summary of trends, drawing attention to some tables. However, the information provided should be such that the data could be used for further analysis.

For **comparisons with the United States**:

The Working Group saw a role for Statistics Canada in providing users with information on the differences and similarities between the two systems. In other words, it would be useful for Statistics Canada to "map" these differences as part of the enhanced web-based dissemination of information presented above. As a result, the Working Group recommends that:

10. Statistics Canada include information on comparisons with the United States in its Web-based information package on HERD. As a minimum, this should include:
    - explanations of the differences between the two countries (procedural, methodological comments on interpreting data sets);
    - links to data on US academic R&D;
    - links to existing studies on the subject.

    Resources permitting, the system could also include a small number of tables comparing trends at the national level, using a simple methodology.

For **health GERD**, the Working Group recommends:

11. that for the purpose of health GERD, there are needs for refinements to current methods, but nothing more.

The refinements include: a) including relevant sectors other than pharmaceuticals in the business enterprise sector, and b) improving coverage of hospitals and institutes (this is included in the recommendations on sponsored research above).

The **costs** of these enhancements are estimated at approximately $350,000 over three years ($130,000, $130,000, $90,000). In addition, CAUBO and AUCC have already provided significant in-kind contributions to this project. Both organizations agreed to continue to work with Statistics Canada in the further development and implementation of this framework. In addition, members of the Working Group, participants in the earlier workshop, as well as the numerous individuals consulted during the initial study, all devoted time and efforts to this project.

Statistics Canada itself would devote approximately $100,000 over three years of existing resources to the further development and implementation of the framework. This leaves a funding requirement of approximately $250,000, i.e. $100,000 for the first two years and $50,000 in the third year.

As far as **sources of funds** are concerned, the Working Group came to the conclusion that funding should be sought from Industry Canada, the granting councils and the Canada Foundation for Innovation. The rationale for this conclusion is that improved data sets on university research funding are very important to policy development and program evaluation. Industry Canada has the primary responsibility for science and technology policy development at the federal level; Industry Canada and the other organizations need the data to assess the impact of their programs.

We believe that implementation of the framework proposed in this report will provide the federal government, provincial governments, funding agencies and analysts of the higher education and research funding systems with a much better set of tools to:

- assess trends in sponsored research funding;
- assess trends in indirect costs of research;
- assess trends in research personnel;
- enable comparison of research resources between Canada and the United States;
- estimate resources devoted to health R&D.

Implementation of this framework would also bring together relevant information not only on funding and personnel, but also on outputs of university research (e.g., graduates, publications, patents) and on linkages with other sectors (intellectual property, bibliometric analyses). This would facilitate analysis of linkages between investments in research and innovation.

We hope that Statistics Canada will move to implement our report, recognizing that implementation will likely be staged over a three-year period. We also hope that major users will contribute financially and in-kind to the further development and implementation of this framework.

Finally, we see the implementation of this framework as a first step. We hope that Statistics Canada, CAUBO, AUCC and major funding agencies will continue working together and develop more comprehensive sets of information. As a priority, they should ensure that inter-institutional research is reported correctly, by the institution that ultimately conducts the research. This means that all those concerned will have to make special efforts to ensure that the CAUBO guidelines are followed. In the long run, we believe that there should be more and better information by discipline and more and better information on grants and contracts. We also hope that Statistics Canada will soon be in a position to include research conducted in community colleges in higher education R&D expenditures.

A framework for enhanced estimations of Higher Education and Health R&D Expenditures

Introduction and Methodology

With the successful completion of the Science and Technology Redesign Project and the preparation of the Strategic Plan of the new Science, Innovation and Electronic Information (SIEID) Division at Statistics Canada, Statistics Canada decided to review the current methods for estimating higher education R&D expenditures (HERD) and health gross expenditures on R&D (health-GERD). This is part of the division's efforts to address the need for improved indicators of R&D, innovation, technology diffusion and human resources related to these activities.

The need to review HERD and health-GERD stemmed from the fact that the research environment for university research has changed considerably since the methods were developed several decades ago. Indeed, more and more budget allocation decisions are now based on the research performance of higher education institutions (measured in large part by national statistics). Also, with the transition to a knowledge-based economy, the way knowledge is generated has changed; more and more university research is performed outside traditional academic departments in affiliated centres, institutes, or hospitals, often by full time researchers who do not hold a traditional academic appointment and whose research activities may not be fully captured in current data.

The 1999 study of HERD and health GERD was completed in the Fall of 1999. As part of this study, a workshop with stakeholders was held in September 1999. One of the recommendations of that workshop, and of the HERD/health GERD study, was that a working Group be created to develop a framework for estimations of HERD and health gross expenditures on R&D (health GERD).

The Working Group on Higher education R&D (HERD) and health R&D expenditures (list of members and resource persons in Appendix A) conducted its work between January and March 2000. The mandate of the Group is in Appendix B.

The working group met four times in early 2000. Background papers were available to members in advance of each the meeting and a report was prepared after the first three meetings (the fourth one being devoted to the preparation of this report). These working papers contain more details of the Working Group's deliberations and recommendations. They should be useful tools to Statistics Canada in the further development and implementation of the framework presented in this report.

While acknowledging that all parts of this project were closely related and overlapping to a degree, the working group agreed to divide the work as follows:

1. HERD—Sponsored research
2. HERD—Other costs of research
3. R&D personnel
4. Dissemination of information on higher education R&D and personnel
5. Comparisons with the United States
6. Health GERD.

For each of these tasks, members identified desirable enhancements, and, for each, they assigned a priority and indicated whether the enhancement would be easy or difficult to implement and whether it should be undertaken in the short, long or medium term. Statistics Canada estimated the costs of each step.

This report discusses each of these areas in turn.

1. HERD—Sponsored Research

The annual financial report prepared by Statistics Canada (Centre for Education Statistics) from data collected and provided by the Canadian Association of University Business Officers (CAUBO) is the major source of sponsored research data. This is an excellent source of data, and members agreed that Statistics Canada should continue to rely on CAUBO for the bulk of information on sponsored research.

The CAUBO Finance Committee is currently reviewing the financial report. Since the Working Group and the Finance Committee were working simultaneously (and had an overlap in membership), the Working Group was able to feed into the work of the Finance Committee, and vice versa.

Sponsored research data provided by CAUBO are not broken down by discipline, field or area of application. Statistics Canada uses an algorithm to attribute sponsored research to three fields: social sciences and humanities, health sciences, and other natural sciences and engineering.

Respondents in the HERD study and participants in the September 1999 workshop had identified a number of desirable enhancements to existing sponsored research data, especially to obtain finer breakdown by discipline or area of application and project by project details. Members agreed with these groups that such enhancements would be desirable. However, members decided not to recommend some of these enhancements for the simple reason that universities would not be able to cope with the additional burden that this would impose upon them. The costs in terms of efforts would far outweigh the benefits and the information, when available, would not longer be timely. Therefore, the Working Group is of the opinion that complex annual surveys should be avoided, at least in the short term.

The Working Group agreed that the data should continue to be divided in three fields and further agreed that the algorithm used by Statistics Canada to attribute funding to fields needs to be modernized.

The Working Group wanted to recommend that the CAUBO data distinguish between grants and contracts, but was informed by the CAUBO Finance Committee that such information was not available. Members hope that CAUBO and the Association of University and Colleges of Canada (AUCC) will work together to make this available in the future.

The CAUBO reports will identify funding from the Canada Foundation for Innovation as sponsored research. To estimate how much of the CFI investment goes to capital expenditures (building as opposed to equipment), it will be necessary for universities to report inter-fund transfers. Members of the Working Group hope that it will be possible to derive the information from the CAUBO report.

Knowing which hospitals and research institutes are included and to what extent is very important to Statistics Canada. The CAUBO Finance Committee supported the Working Group in this regard and will recommend to the CAUBO Board of directors that universities present research data in two categories: data reported in the university financial statements, and data on research conducted in affiliated institutions that are not included in the university financial statements. A list of institutions in both categories will be available, along with the amount of research data for those institutions not included in the financial statements. Once Statistics Canada knows which institutions are included and which are missing, it can go to them directly (through its survey of non-profit organizations) or obtain information from the hospital data collected by CIHI (Canadian Institute for Health Information).

With respect to guidelines, members expressed concern that the degree of adherence to the guidelines had deteriorated, for various reasons, including administrative cuts and the desire to include more and more under research, since the data are used for allocation purposes. Members were encouraged to learn that the CAUBO Finance Committee was reviewing the guidelines and planning training sessions. Statistics Canada and CAUBO are working together in reviewing the guidelines for sponsored research.

Members stressed the growing importance of inter-institutional collaboration: the system should ensure that money that flows to a university and is passed to another one ends up in the books of the university that ultimately conducts the research and spends the funds. The CAUBO Finance Committee commented that this is possible only if the university is simply a "pass-through". If research is conducted at several locations and part of the funds are transferred later, there is no way to ensure that some funds are not counted twice. This does not have a major impact on national statistics. On the other hand, this has an impact when sponsored research data are used to allocate funding to institutions. Universities that administer grants on behalf of others appear to have received more funds than what they actually received. Given that funding agencies want to encourage inter-institutional collaboration, something should be done to ensure that the data are

corrected when used for allocation purposes. The Working Group suggests that universities, through AUCC and CAUBO, and granting agencies work together in finding a solution to this problem. The Working Group further suggests that CAUBO, through training sessions and other means, strongly encourages institutions to follow the guidelines.

In summary, the Working Group **recommends**:

1. that Statistics Canada continue to rely mainly on the annual financial report prepared by Statistics Canada (Centre for Education Statistics) from data collected and provided by the Canadian Association of University Business Officers (CAUBO).

2. that Statistics Canada continue to work closely with CAUBO in its efforts to improve the reporting by universities of financial information, in particular with respect to sponsored research funding.

3. that Statistics Canada continue to estimate sponsored research in three fields, namely health sciences, natural sciences and engineering, and social sciences and humanities.

4. that Statistics Canada improve its methods to estimate research by field, by conducting occasional surveys of "typical" universities (via the research office, not the finance office) to obtain estimate of research funding by field.

As mentioned above, the Working Group would have liked to recommend an expansion of CAUBO data to include information by broad discipline and distinction between grants and contracts. The Working Group understands that this is not feasible at this time, but **suggests** that CAUBO and the Association of University and Colleges of Canada (AUCC) consider such changes in the longer term.

Given that community colleges are now doing a significant amount of R&D, the Working Group **suggests** that Statistics Canada start collecting data on college R&D (through financial data on colleges collected by the Centre of Education Statistics) and include them in HERD. This is a suggestion, not a recommendation, as the Working Group did not study this issue in detail.

The Working Group also suggests that universities and granting agencies work together in finding a solution to the reporting of inter-institutional awards.

Sponsored research–recommended framework

Issue	What needs to be done	By whom (costs)	Term	Difficulty	Priority
Sources of funds	no action at this time				Low
Disciplines or fields	Three fields. Occasional survey of typical institutions via research	Statistics Canada **($15000 in year 3**)	medium	medium	High
Areas of application	No for now	n/a for now		high	low
Hospitals/ institutes	clarify what is included	CAUBO/SC*	short	easy	High
Inter-institutional	ensure funds are "netted" (only clear-cut cases are feasible)	CAUBO/SC*		very difficult	High
Guidelines	improve guidelines	CAUBO/SC*	short	medium	High

***** CAUBO/SC means CAUBO Finance Committee (with Statistics Canada's input)

2. HERD—Other Costs of Research

The Working Group agreed that the algorithm currently used to estimate the non-sponsored research part of HERD should be changed to reflect the fact that total costs of research are, in part, proportional to sponsored research costs. Total research costs would then be the sum of:

- sponsored research costs (as discussed above); plus
- indirect costs of sponsored research (not reimbursed by sponsors), estimated using Canadian and US methods;
- fraction of researchers' time not paid by sponsored research funds, including the research time of faculty members that do not receive sponsored research funding and the time of researchers who receive sponsored research funding (unless their salaries are paid by sponsored research); this would require the review of existing algorithms;
- the addition of a fourth term, i.e. non-salary costs of unsponsored research should be contemplated (this would encompass mainly internal university research funds and indirect costs of unsponsored research). Some members of the Working Group are not convinced about the wisdom of adding this fourth term, especially given that unsponsored research is not counted in the United States.

The table on page 15 summarizes the steps required.

In summary, the working group **recommends**:

5. that Statistics Canada revise the current method used to estimate costs of research borne by the institutions themselves and replace it by an estimation of indirect costs of research and an estimation of faculty member salaries.

   This method was tested by some members and resource persons of the Working Group. It leads to more reasonable estimates by field and by institution, as it assumes that some of the costs borne by institutions themselves are proportional to sponsored research costs and some are proportional to faculty members salaries. The current algorithm is based exclusively on numbers of faculty members and their "consumption of research resources".

Total estimated costs of items 1 and 2, over three years: **$130,000**.

HERD–recommended framework

Issue	What needs to be done	Costs	Term	Difficulty	Priority
Change algorithm	planning and revisions to historical data (details below)	**$65,000** over three years	short		high
Sponsored research	see table under item 1	**$15000** (item 1)			
Indirect costs	Use and refine CAUBO 1982 method	**$15000** over three years	short	easy	High
	Obtain info from univ. that have US rates and any other info/Perhaps survey smaller univ.		med	easy	med
	Netting out indirect costs from sponsored research		short	easy	low, as amount relatively small
	Alternatively, asking univ. about overhead		med	easy	
non-salary costs of unsponsored research	As a first step, try to estimate extent, then find out how to get the information	**$10,000**	med	difficult	low
Salaries	Refine and verify method outlined in this paper	**$25,000** over three years for the three steps	short	easy	high
	Use existing recent Canadian faculty time surveys to validate		med	med	med
	Conduct faculty time survey for smaller inst.		long	high & high response burden	

3. R&D Personnel

In addition to data on gross expenditures on R-D, countries, including Canada, provide the OECD with data on personnel engaged in R-D. In the government and business sector, surveys of R-D include questions on numbers of R&D personnel. In the higher education sector, there are no surveys. Therefore, data need to be estimated for that sector. Estimating numbers of R&D personnel in the higher education sector is complicated for several reasons, the major one being that teaching and research are "joint products" of universities and cannot be easily separated.

The Working Group agreed that current methods used to estimate R&D personnel in universities are much too complex. The method needs to be simplified and streamlined. The information has to be derived from reasonable assumptions and without spending too much energy and without imposing a report burden on institutions.

The Working Group came to the conclusion that the best way to proceed would be to use a simple method that would take advantage of the new proposed method for estimating HERD. If HERD is known for each of the three discipline groups, and if the fraction used for salaries is known, there should be a relatively simple way to estimate numbers of research personnel (using average salaries from census data or, for faculty members, data from the Centre for Education Statistics).

Ideally, postdocs should be in their own category. The only problem is that this may not be feasible with any degree of accuracy, since universities themselves generally do not know how many postdocs there are on campus.

In summary, the Working Group **recommends**:

6. that Statistics Canada simplify the current methodology to align it more with the new method to estimate HERD-Other costs of research.

7. that R&D personnel be divided into a) faculty members and equivalent; b) graduate students; c) others, and, should this prove feasible in the longer term, d) postdocs.

8. that, to this end, Statistics Canada make use of data from CAUBO (on salaries paid out of sponsored research funds for various categories of personnel), granting councils (for estimates of proportion of sponsored research funds spent on the various categories of personnel), Centre for Education Statistics (for faculty members and graduate student numbers), and perhaps census (for salaries for various occupational groups).

The table on page 17 summarizes the steps recommended. The costs to Statistics Canada is estimated at **$120,000** over three years.

R&D personnel–framework

Issue	What needs to be done	Costs	Term	Difficulty	Priority
Change method	see details under each step below	**$120,000** over 3 years	over 3 years	difficult	high
Faculty members	use same method as HERD	see section 2, other costs		difficult	
	develop method to estimate part-time numbers and proportion of research time, using CAUBO academic salaries; validate with ACMC data			difficult	
Graduate students	Stat Can data available			easy	
	estimate percentage of time, starting with existing method, then improve			difficult	
Others	derive number in each of three fields by using proportion of sponsored research money used for salaries of "others"			difficult	
Postdocs	estimate numbers of postdocs		med	difficult	med

4. Dissemination of Information on University Research

In the interviews for the HERD study, some respondents had suggested that there should be an occasional publication summarizing the trends in university research, including inputs, outputs and linkages: "*In addition to its traditional publications on HERD and R&D personnel, Statistics Canada should envisage regular publications analysing trends in higher education R&D support, providing comparisons with the US, as well as integrated analyses of the university research enterprise and its outcomes and impacts, using data gathered through projects carried out in the SIEI division and in other divisions."*

This suggestion was reinforced at the September 16, 1999 workshop.

The Working Group agreed with the suggestion. However, this need not be a publication, but could be a Web site, with reference to various data sets or documents.

Depending on the data set, information should be available at national, provincial or university level. For example, sponsored research data must be available by university (they are now made available by university by CAUBO), whereas data on R&D personnel could be at the provincial level, given that they rely on many assumptions. Members agreed that minimal analysis would be required, e.g. highlights, or a summary of trends, drawing attention to some tables. However, the information provided should be such that the data could be used for further analysis by users. In other words, it should be relatively easy for the less sophisticated users to obtain meaningful information, whereas others could draw on the data for more detailed analysis, or contact Statistics Canada for specialized reports. Methodologies and assumptions should also be clearly explained to ensure that users understand the limitations of the data. The data would be updated as they become available, but analysis would not necessarily be done on a yearly basis.

In summary, the Working Group **recommends**:

9. that Statistics Canada develop a comprehensive Web site, that would include relevant information on inputs, outputs and linkages, including references to various data sets and documents (some of which are published by other organizations).

So much time is spent gathering data to demonstrate the importance of research to the country. Having information at hand would facilitate the process, one more reason to proceed. Costs are estimated at **$50,000**.

Dissemination– proposed framework

Issue	**Status of data**	**Level of analysis**	**Cost**	**Term**	**Prio-rity**	**Diff.**
comprehensive electronic publication	existing	high level summary	**$50,000** over 3yrs	med	high	med
sponsored research	existing	university		med	high	easy
HERD	existing	prov or univ		med	high	easy
R&D personnel	existing	province		med	high	easy
full-time teachers	existing	university				
bibliometric studies	existing					easy
intellectual property mgmt	existing	prov or univ				
graduate degrees	existing	univ.				
other as they become available; references to other data sets, e.g. granting council studies	varies			long		easy

5. Comparisons with the United States

In the recent study of HERD, Canada-US comparisons were a priority of users.

The working group agreed that comparisons with the US were important but concluded that improving the data on HERD and Health GERD was a higher priority.

The Working Group saw a role for Statistics Canada in providing users with information on the differences and similarities between the two systems. In other words, it would be useful for Statistics Canada to "map" these differences as part of the enhanced Web-based dissemination of information discussed in section 4.

The working paper on this subject explains the differences between the systems used in the two countries. The following table summarizes these differences that, in large part, stem from the major differences between university research funding policies and programs in the two countries.

Differences between US and Canada's data sets

What	Canada	US
Sponsored research - direct costs	Included	Included, except for the humanities
Sponsored - indirect costs	Estimated in revised HERD	Included
Sponsored - salary costs	Estimated in revised HERD	Included only if reimbursed
Unsponsored research	salaries included; internal university funds budgeted for research excluded; rest excluded.	salaries excluded; separately budgeted funds included; rest excluded.
Hospital based research	Increasingly included; Clinical trials partially included	Partially included Clinical trials not included

The Working Group **recommends** that:

10. Statistics Canada include information on comparisons with the United States in its Web-based information package on HERD. As a minimum, this system should include:
    - explanations of the differences between the two countries (procedural, methodological comments on interpreting data sets);
    - links to data on US academic R&D;
    - links to existing studies on the subject.

    Resources permitting, the system could also include a small number of tables comparing trends at the national level, using a simple methodology.

US comparisons—Proposed framework

Issue	Cost	Term	Difficulty	Priority
Whether or not to include US comparisons in "publication"	**$20,000**	med		med
What to include:				
links to US			easy	high
selected tables				med
description of methods			med.	high
links to existing studies			easy	med
What method to use				
develop methodology to compare apples and apples, further developing suggestions in working paper (also include adjustments for purchasing power parity)			diff.	med

Costs are estimated at only $5,000 (to map the differences between the two systems), as the costs of the development of the Web site are included under "dissemination.

6. Health

The Working Group reached a consensus that for the purpose of health GERD, there are needs for refinements to current methods, but nothing more.

The Working Group **recommends**:

11. that for the purpose of health GERD, there are needs for refinements to current methods, but nothing more.

The refinements include: a) including relevant sectors other than pharmaceuticals in the business enterprise sector, and b) improving coverage of hospitals and institutes (this is included in the recommendations on sponsored research above).

Total costs are estimated at **$30,000.**

Health GERD–draft framework, second iteration

Issue	What needs to be done	Cost	Term	Difficulty	Priority
Methods	business enterprise: include more than pharmaceuticals	**$30,000**	short	easy	high
	private non profit/higher education: avoid duplication and gaps	part of HERD/ sponsored research	short	difficult	high

Summary of Costs and Potential Sources of Funds

The **costs** of these enhancements are estimated at $350,000 over three years ($130,000, $130,000, $90,000). In addition, CAUBO and AUCC have already provided significant in-kind contributions to this project. Both organizations agreed to continue to work with Statistics Canada in the further development and implementation of this framework. Numerous other organizations have also contributed in-kind to this project. Indeed, through membership in the Working Group, participation in the earlier workshop, and response to the consultation, federal granting councils and departments, provincial organizations, universities and university associations have devoted considerable time and efforts to this project.

SIEID itself would devote approximately $100,000 over three years of existing resources to the further development and implementation of the framework. This leaves a funding requirement of $250,000, i.e. $100,000 for the first two years and $50,000 in the third year.

As far of **sources of funds** are concerned, the Working Group came to the conclusion that funding should be sought from Industry Canada, the granting councils and the Canada Foundation for Innovation. The rationale for this conclusion is that improved data sets on university research funding are very important to policy development and program evaluation. Industry Canada has the primary responsibility for science and technology policy development at the federal level; Industry Canada and the other organizations need the data to assess the impact of their programs.

Conclusion

We believe that the implementation of the framework proposed in this report will provide the federal government, provincial governments, funding agencies and analysts of the higher education and research funding systems with a much better set of tools to:

- assess trends in sponsored research funding;
- assess trends in indirect costs of research;
- assess trends in research personnel;
- enable comparison of research resources between Canada and the United States;

- estimate resources devoted to health R&D.

Implementation of this framework would also bring together relevant information not only on funding and personnel, but also on outputs of university research (e.g., graduates, publications, patents) and on linkages with other sectors (intellectual property, bibliometric analyses). This would facilitate analysis of linkages between investments in research and innovation.

We hope that Statistics Canada will move to implement our report, recognizing that implementation will likely be staged over a three-year period. We also hope that major users will contribute financially and in-kind to the further development and implementation of this framework.

Finally, we see the implementation of this framework as a first step. We hope that Statistics Canada, CAUBO, AUCC and major funding agencies will continue working together to develop more comprehensive sets of information. As a priority, they should ensure that inter-institutional research is reported correctly, by the institution that ultimately conducts the research. This means that all those concerned will have to make special efforts to ensure that the CAUBO guidelines are followed. In the long run, we believe that there should be more and better information by discipline and more and better information on grants and contracts. We also hope that Statistics Canada will soon be in a position to include research conducted in community colleges in higher education R&D expenditures.

Appendix A—List of Members and Resource Persons

Members of Working Group

- Carmelita Boivin-Cole, Executive Director, Maritime Provinces Higher Education Commission, Fredericton, NB, *C.Boivin@mphec.ca*, tel: (506) 444-5497;
- Maurice Cohen, Executive Director, Canadian Association of University Business Officers (CAUBO), *mcohen@caubo.ca,* tel: 563-3961, ext. 268;
- Michael Cohen, Canadian Institute for Health Information, *mcohen@cihi.ca*, tel: (613)-241-7860;
- Robert Davidson, Directeur, Recherche et analyse de politiques, Association des universités et collèges du Canada (AUCC), *rdavidso@aucc.ca*, tél : 613-563-3961, poste 202 (first meeting);
- Jean Farrall, Director (Research Services), University of Ottawa, *farrall@uottawa.ca,* tel: (616) 562-5842
- Peter Hill, Director (University Research Policy), Alberta Department of Science and Innovation, Edmonton, *peter.hill@gov.ab.ca*, tel: (780) 422-4845;
- Jean Lebel, Directeur, Direction des études de cycles supérieurs et de la recherche, Université du Québec, Québec, *Jean_Lebel@uqss.uquebec.ca*, tél. : 418-657-4118;
- Marshall Moffat, Director, Knowledge Infrastructure, Industry Canada, *Moffat.Marshall@ic.gc.ca*, tel: (613) 990-2773;
- Michael O'Brecht, Coordinator (Program Evaluation), Medical Research Council, *mobrecht@mrc.gc.ca*, tel: (613) 954-1817.
- Herb O'Heron, Senior Analyst, AUCC (2nd, 3rd and 4th meetings).
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Resource-persons

- Brigitte Bouchard, Centre for Education Statistics, Statistics Canada, *boucbri@statcan.ca*, (613) 951-9167 (first three meetings)
- Peter Elliott, Centre for Education Statistics, Statistics Canada (3rd and 4th meetings)
- Fred Gault, Director, Science, Innovation and Electronic Information Division (SIEI) Division, Statistics Canada, *gaultfd@statcan.ca*, (613) 951-2198
- Paul McPhie, Assistant Director, SIEI Division, Statistics Canada, *mcphpau@statcan.ca*, tel: (613) 951-9038;
- Bert Plaus, Chief, Science and Innovation Surveys, SIEI Division, Statistics Canada, *PlauBer@statcan.ca*, tel: (613) 951-6347;
- Janet Thompson, SIEI Division, Statistics Canada, *ThomJan@statcan.ca,* tel: (613) 951-2580;

- Mireille Brochu, Consultant (Facilitator for the Working Group), *mbrochu@magma.ca*, tel: 613) 746-9491, fax: (613) 746-9405;
- Janet Halliwell, JEH Associates, *jehalli@magma.ca*, tel: (613) 747-0569.

Appendix B—Mandate of the Working Group

The Working Group will advise the Director of the Science, Innovation and Electronic Information Division of Statistics Canada on the development of a framework for improvements to:

- higher education R&D estimates (HERD) and health gross expenditures on R&D (health-GERD), including R&D personnel; and
- the dissemination of the information on higher education and health R&D.

The Working Group will also prepare a proposal to Statistics Canada for the implementation of such a framework, working closely with the SIEI Division which will develop cost estimates.

In developing the framework and the proposal, the Working Group will articulate the need for and benefits of changes to existing collection and dissemination methods, and will weigh them against costs, not only in terms of the costs of the program to Statistics Canada, but in terms of the additional report burden that could be imposed on institutions. The Working Group will also advise Statistics Canada on the potential sources of funding for the program.

It is expected that the first and last meetings of the Working Group will have members present, and that, between these meetings, business will be conducted by telephone and e-mail. Ideally, the report should be completed by the end of March.