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Estimates of Total Expenditures on Research and Development in the Health Field in Canada, 1988 to 2003

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Symbols

The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^S value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- ^P preliminary
- ^r revised
- x suppressed to meet the confidentiality requirements of the Statistics Act
- ^E use with caution
- F too unreliable to be published

GERD	Gross Domestic Expenditures on Research and Development
HERD	Higher Education Research and Development
NAICS	North American Industrial Classification System
NSE	Natural Sciences and Engineering
OECD	Organization for Economic Co-operation and Development
PNP	Private Non-Profit Organizations
R&D	Research and Development
S&T	Science and Technology
SIEID	Science, Innovation and Electronic Information Division
SSH	Social Sciences and Humanities

Introduction:

Estimates of Health R&D in Canada

R&D is defined as creative work undertaken on a systematic basis to increase the stock of scientific and technical knowledge and to use this knowledge in new applications. Expenditures on R&D are an important indicator of the effort devoted to creative activity in science and technology.

Gross domestic expenditures on research and development (GERD) is a statistical series, constructed by adding together the intramural expenditures on R&D as reported by the performing sectors. As a term used by OECD Member countries, it is defined as “total intramural expenditure on R&D performed on the national territory during a given period. It includes R&D performed within a country and funded from abroad but excludes payments for R&D performed abroad”.¹ GERD includes R&D expenditures in the Natural Sciences and Engineering (NSE) and the Social Sciences and Humanities (SSH) fields.

Canadian health research is conducted in universities, teaching hospitals, business enterprises, government laboratories and private non-profit organizations. This research is funded from a variety of sources including public, private, domestic and foreign.

This is the fifth time Science, Innovation and Electronic Information Division (SIEID) of Statistics Canada has published an estimate of health R&D spending in Canada. Health sciences, being part of the NSE, are not identified in our surveys. It is therefore necessary to estimate R&D expenditures in the health field by incorporating all relevant data available to us.

The following sections contain the definition of health GERD in each of the sectors and also the method used in each sector to prepare these estimates.

1. Frascati Manual - Proposed Standard Practice for Surveys on Research and Experimental Development, OECD, Paris, 2002, p. 121.

Definitions:

National Health GERD is estimated using data from five different surveys. The definition of Health in each of the sectors is as follows:

Federal and Provincial Governments:

R&D programmes directed towards the scientific activities aimed at protecting, promoting and restoring human health broadly interpreted to include health aspects of nutrition and food hygiene. It ranges from preventative medicine, including all aspects of medical and surgical treatment, both for individuals and groups, and the provision of hospital and home care, to social medicine and pediatric and geriatric research.

Business Enterprises:

R&D performed in the "pharmaceutical and medicine industry (manufacturing)", "wholesale trade (pharmaceutical)" and selected companies in "scientific research and development services (pharmaceutical)" industries

Higher Education:

R&D performed in the health sciences by the "health professions" teaching field.

Private Non-Profit Organizations:

R&D performed in medical sciences, including medicine, dentistry, pharmacy etc.

Methodology:

Federal government sector: Federal government R&D expenditures in the health field from 1988 until 2003^p, are derived from the Federal Science Expenditures and Personnel survey of government departments and agencies. Data were collected from responses to a question on health as a socio-economic objective for R&D spending. Federal government data are published in Catalogue No. 88-204 XIE.

Provincial government: R&D expenditures in the health field are based on values from provincial science surveys which identify intramural R&D expenditures in the health socio-economic objective field.

Business enterprise sector: The Pharmaceutical and medicine manufacturing industry is the most significant source of health R&D in the Business enterprise sector. However, since industries are classified by NAICS, which is based on the principal source of revenue, pharmaceutical R&D is also found in Wholesale trade and Scientific research and development services. NAICS code 414510 identifies the pharmaceutical industries within Wholesale trade. In the Scientific research and development services industry, major performers of pharmaceutical R&D were identified on a case by case basis.

The higher education sector: Health R&D statistics are derived from Statistics Canada's revised higher education R&D estimates¹ (STC Catalogue 88-001 Vol. 28, No. 1) which identify R&D performed in the health field. The revised estimates are based on the assumption that total R&D expenditures are equal to the sum of: a) sponsored research expenditures (including all teaching hospitals); b) indirect expenditures on sponsored research; c) a value for the fraction of faculty members' time assumed to be devoted to sponsored and non-sponsored research; and d) indirect expenditures related to faculty members' time on research.

Private non-profit sector: Values used for estimating health R&D expenditures in the private non-profit sector are those identified as health-related in survey responses. See Volume 28, No. 4 of this publication for further information.

1. Statistics Canada 1999. Review of HERD and Health GERD - Report to Statistics Canada, Mireille Brochu

Limitations of Health GERD

Limitations of the Health GERD are similar to those of the GERD.

The GERD, like any other social or economic statistic, can only be approximately true. Different components are of different accuracy: sector estimates probably vary from $\pm 5\%$ to $\pm 15\%$ in accuracy. However, the GERD estimates are sufficiently reliable for their main use as an aggregate indicator for science policy.

One of the most important problems relating to GERD concerns its definition. There remains some ambiguity in defining precisely what constitutes R&D or, for example, in a continuing project, determining the precise point at which the project passes the boundary of R&D and becomes exploitation of a process or product on which it may be said that the R&D stage has been completed. This ambiguity is perhaps less serious in internal time series, where it may be expected that the year-to-year application of the definitions by the same reporting units are at least consistent.

A second difficulty arises with regards to survey design. The people best qualified to apply the R&D definitions and classifications - scientific and technical personnel engaged in the direct management of S&T activity - rarely participate in the statistical agency's data collection process. Because the data collected are concerned not with scientific and technical content, but financial and labour inputs to achieving this content, the questionnaires tend to be addressed to and completed by financial and management staff. This is a fundamental problem of all surveys addressed to large organizations, whether they are public or private.

These two problems account for the limited amount of geographic and scientific detail in the published GERD. The amount of detail presented, for example, in the Canadian GERD as published by Statistics Canada is limited by the nature of the surveys, and the other data collection and analysis instruments. Nor is it possible to increase the amount of detail because this would require switching to new kinds of data collection instruments in a vastly expanded survey operation.

Another reason for the limited detail about sectors stems from the fact that R&D is often a secretive endeavour. Private sector companies usually want to surprise competitors with a new product. Thus the money spent on the R&D may be reported, but details about R&D projects would not. Similarly, a government department such as National Defence might report R&D expenditures but not the nature and detail of the respective R&D projects. At best, the GERD provides broad categories of the nature of the R&D work underway; for example, "Transportation equipment", "Business machines", "Aircraft", etc.

To summarize, the GERD serves as a general indicator of S&T activity and not as a detailed inventory of R&D projects within an organization, sector, or province. It is an estimate and as such can show trends in R&D expenditures by sector and sub-sector, by province and country, from year-to-year. In this capacity, the GERD estimates are sufficiently reliable for their main use as an aggregate indicator for science policy.

Statistical Tables

Gross domestic expenditures on R&D (GERD) in the health field¹, 1988						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
in millions of dollars						
Federal government	41	0	4	192	18	255
Provincial governments	0	17	14	56	8	95
Business enterprise	0	0	157	33	8	198
Higher education ²	0	0	0	500	0	500
Private non-profit	0	0	0	106	32	138
Foreign	0	0	21	8	6	35
Total	41	17	196	895	72	1,221

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1989						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
in millions of dollars						
Federal government	50	0	4	210	18	282
Provincial governments	0	22	16	83	8	129
Business enterprise	0	0	199	46	6	251
Higher education ²	0	0	0	532	0	532
Private non-profit	0	0	0	102	41	143
Foreign	0	0	14	7	7	28
Total	50	22	233	980	80	1,365

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1990						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	64	0	9	241	20	334
Provincial governments	0	26	22	85	12	145
Business enterprise	0	0	273	50	10	333
Higher education ²	0	0	0	558	0	558
Private non-profit	0	0	0	110	42	152
Foreign	0	0	17	5	7	29
Total	64	26	321	1,049	91	1,551

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1991						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	55	0	9	236	22	322
Provincial governments	0	29	18	87	13	147
Business enterprise	0	0	269	87	11	367
Higher education ²	0	0	0	616	0	616
Private non-profit	0	0	0	126	47	173
Foreign	0	0	28	4	8	40
Total	55	29	324	1,156	101	1,665

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1992						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	56	0	10	243	8	317
Provincial governments	0	33	17	88	11	149
Business enterprise	0	0	324	107	11	442
Higher education ²	0	0	0	670	0	670
Private non-profit	0	0	0	113	25	138
Foreign	0	0	54	8	5	67
Total	56	33	405	1,229	60	1,783

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1993						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	53	0	7	282	9	351
Provincial governments	0	29	9	94	14	146
Business enterprise	0	0	403	117	13	533
Higher education ²	0	0	0	713	0	713
Private non-profit	0	0	0	153	25	178
Foreign	0	0	71	8	6	85
Total	53	29	490	1,367	67	2,006

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1994						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	57	0	6	283	8	354
Provincial governments	0	31	8	94	15	148
Business enterprise	0	0	460	109	12	581
Higher education ²	0	0	0	721	0	721
Private non-profit	0	0	0	166	34	200
Foreign	0	0	87	9	5	101
Total	57	31	561	1,382	74	2,105

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1995						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	63	0	9	294	7	373
Provincial governments	0	33	9	97	15	154
Business enterprise	0	0	547	105	15	667
Higher education ²	0	0	0	753	0	753
Private non-profit	0	0	0	169	37	206
Foreign	0	0	156	10	5	171
Total	63	33	721	1,428	79	2,324

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1996^r						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	76	0	10	255	6	347
Provincial governments	0	32	7	89	16	144
Business enterprise	0	0	610	118	9	737
Higher education ²	0	0	0	754	0	754
Private non-profit	0	0	0	200	39	239
Foreign	0	0	240	14	7	261
Total	76	32	867	1,430	77	2,482

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1997						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	78	0	9	261	6	354
Provincial governments	0	32	7	111	18	168
Business enterprise	0	0	682	134	10	826
Higher education ²	0	0	0	786	0	786
Private non-profit	0	0	0	208	37	245
Foreign	0	0	273	16	1	290
Total	78	32	971	1,516	72	2,669

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1998^f						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
in millions of dollars						
Federal government	87	0	10	275	10	382
Provincial governments	0	36	9	111	16	172
Business enterprise	0	0	767	145	8	920
Higher education ²	0	0	0	864	0	864
Private non-profit	0	0	0	213	31	244
Foreign	0	0	309	20	2	331
Total	87	36	1,095	1,628	67	2,913

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 1999^f						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
in millions of dollars						
Federal government	103	0	7	362	6	478
Provincial governments	0	30	7	145	12	194
Business enterprise	0	0	807	167	5	979
Higher education ²	0	0	0	907	0	907
Private non-profit	0	0	0	219	23	242
Foreign	0	0	383	23	2	408
Total	103	30	1,204	1,823	48	3,208

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 2000^r						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	116	0	9	433	3	561
Provincial governments	0	40	4	176	11	231
Business enterprise	0	0	943	211	8	1,162
Higher education ²	0	0	0	999	0	999
Private non-profit	0	0	0	264	21	285
Foreign	0	0	479	20	1	500
Total	116	40	1,435	2,103	44	3,738

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 2001^r						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	152	0	10	564	3	729
Provincial governments	0	40	5	214	12	271
Business enterprise	0	0	1,129	236	6	1,371
Higher education ²	0	0	0	1,074	0	1,074
Private non-profit	0	0	0	312	18	330
Foreign	0	0	593	34	1	628
Total	152	40	1,737	2,434	40	4,403

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 2002^f						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	160	0	11	615	3	789
Provincial governments	0	42	6	233	14	295
Business enterprise	0	0	1,206	257	7	1,470
Higher education ²	0	0	0	1,168	0	1,168
Private non-profit	0	0	0	339	15	354
Foreign	0	0	634	37	1	672
Total	160	42	1,857	2,649	40	4,748

1. As data are not provided specifically by "Health Field", this is STC's best estimate.

2. Includes teaching hospitals.

Gross domestic expenditures on R&D (GERD) in the health field¹, 2003^p						
Funding sector	Performing sector					Total
	Federal government	Provincial governments	Business enterprise	Higher education ²	Private non-profit	
	in millions of dollars					
Federal government	163	0	11	676	3	853
Provincial governments	0	46	6	256	14	322
Business enterprise	0	0	1,247	283	8	1,538
Higher education ²	0	0	0	1,284	0	1,284
Private non-profit	0	0	0	373	15	388
Foreign	0	0	655	41	1	697
Total	163	46	1,919	2,913	41	5,082

3. As data are not provided specifically by "Health Field", this is STC's best estimate.

4. Includes teaching hospitals.

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