



Catalogue no. 88-001-XIE

# Science Statistics

March 2007 edition



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March 2007

Catalogue no. 88-001-XIE

ISSN 1209-1278

Frequency: Irregular

Ottawa

La version française de cette publication est disponible sur demande (n° 88-001-XIF au catalogue).

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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<sup>s</sup> 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

# Table of contents

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<b>Highlights</b>	<b>4</b>
<b>Analysis</b>	<b>5</b>
Estimates of total spending on research and development (R&D) in the health field in Canada, 1989 to 2006	5
<b>Related products</b>	<b>7</b>
<b>Statistical tables</b>	
1 Gross domestic expenditures on research and development (GERD) in the health field	10
1-1 Compared to total GERD	10
1-2 Performing sector and funding sector	11
1-3 Higher education sector by funding sector, 2004	12
1-4 Higher education sector by provincial population, 2004	12
1-5 Historical	13
<b>Data quality, concepts and methodology</b>	
Estimates of total spending on R&D in the health field in Canada, 1989 to 2006	16
<b>Charts</b>	
1. Gross domestic expenditures on research and development in the health field	6
2. Gross domestic expenditures on R&D in the health field, by performer, 2006	6

# Highlights

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## Research and development in the health field 1989 to 2006 (preliminary)

- Spending on research and development on health last year accounted for nearly one-quarter of total spending on R&D in Canada, according to preliminary data (table 1-1).
- Total spending on research and development in the field sector hit an estimated \$6.6 billion in 2006, up 6.8% over the previous year. This represented just over 23% of total spending on R&D, up from 17% in 1996 (table 1-1).
- The higher education sector performed 63% of all R&D in the health field, the largest share. In 2006, this sector, which includes universities and teaching hospitals, performed an estimated \$4.1 billion worth of health R&D, a 10.0% increase from the previous year (table 1-2).
- Business enterprises, a distant second to the higher education sector, performed an estimated \$2.1 billion in health R&D, up 2.5%. Business enterprises accounted for about a third of the total (table 1-2).
- In terms of funding, universities overtook business enterprises as the largest funder of health R&D, spending just over \$1.8 billion in 2006. Business enterprises spent \$1.7 billion, and the federal government \$1.2 billion (table 1-2).
- Private non-profit organizations more than doubled their funding for health R&D from \$242 million in 1999 to \$533 million in 2006 (table 1-2).
- On a regional basis, universities and teaching hospitals in Ontario and Quebec performed 73% of total R&D spending on health in 2004, the most recent year for which regional information is available. The higher education sector in the Atlantic provinces collectively accounted for 4.3% (table 1-3).

## Analysis

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### **Estimates of total spending on research and development (R&D) in the health field in Canada, 1989 to 2006**

Expenditure on R&D in the health field in 2006 is projected to reach \$6.6 billion in 2006, up by \$422 million (6.8%) over the figures for the previous year (table 1-1).

Indicative of the increasing importance of health R&D, the ratio of expenditure on health R&D to the gross domestic expenditure on research and development (GERD) was recorded at 23.3% in 2006 (up from 22.7% in 2005) (table 1-1).

Health expenditure R&D per capita also increased from \$191 in 2005 to \$202 in 2006 (table 1-1).

Importantly, after a slight decline of 0.7% in 2003 (from \$4.7 billion to \$4.6 billion), health R&D expenditure in 1997 constant dollars bounced back in 2004 and recorded an impressive growth of 10.1% (to reach \$5.1 billion). However, in 2005, the increase in health R&D expenditure (in 1997 constant dollars) experienced a rather sluggish growth of only 1.5% (table 1-1).

The higher education sector continues to perform the largest share of health R&D in Canada, spending slightly over \$4.1 billion in 2006 (or 63% of total health R&D expenditure). This represents an increase of \$377 million (10%) over the amount spent in 2005 (\$3.8 billion) on health R&D. Business enterprises came in a distant second, accounting for slightly above \$2.1 billion (or 32% of total health R&D expenditure) in 2006 (table 1-2).

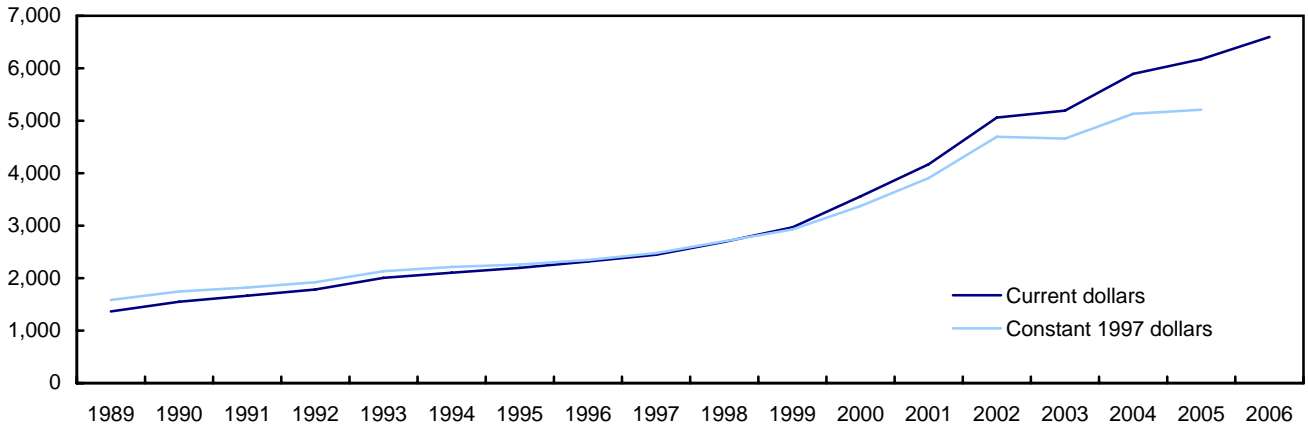
Universities and teaching hospitals also emerged as the largest funder of health R&D in 2006, spending \$1.8 billion dollars (or 28%) of total funding for health R&D. Business enterprises and the federal government placed second and third with funding outlays of \$1.7 billion and \$1.2 billion respectively (table 1-2).

Importantly, funding of health R&D by private non-profit firms has more than doubled from \$242 million in 1999 to \$533 million in 2006 (table 1-2).

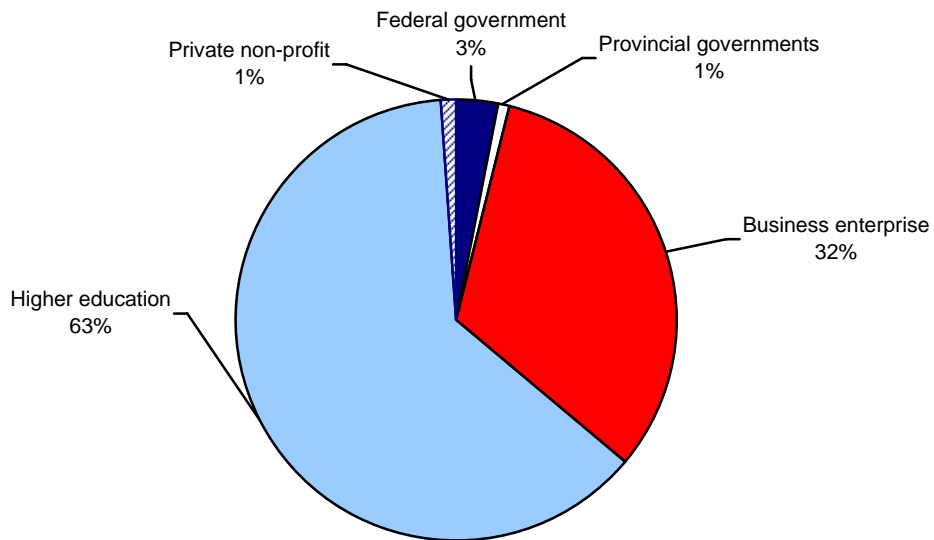
In a pattern that closely mimics the overall pattern of R&D performance in Canada, educational institutions in Ontario and Quebec performed 73% (\$2.6 billion) of health R&D in Canada in 2004 (the year that the latest information on regional health R&D data is available). On the other hand, higher education institutions in the Atlantic provinces collectively accounted for a meager 4.3% (\$155 million) of total health R&D expenditure in the same year (table 1-3).

**Chart 1**  
**Gross domestic expenditures on research and development in the health field**

millions of dollars



**Chart 2**  
**Gross domestic expenditures on R&D in the health field, by performer, 2006**





## Related products

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### Selected publications from Statistics Canada

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88-202-X	Industrial Research and Development...intentions
88-204-X	Federal Scientific Activities
88-522-X	Science and Technology Activities and Impacts: A Framework for a Statistical Information
88F0006X	Science, Innovation and Electronic Information Division Working Papers
88F0006X2001005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1990-91 to 1998-99
88F0006X2002008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1991-92 to 1999-2000
88F0006X2003008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1994-95 to 2000-2001
88F0006X2004005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1995-1996 to 2001-2002
88F0006X2005002	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1996-1997 to 2002-2003
88F0006X2005019	Estimation of Research and Development Expenditures in the Higher Education Sector, 2003-2004
88F0017M	Science, Innovation and Electronic Information Division Research Papers

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### Selected technical and analytical products from Statistics Canada

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88F0017M1999006	Diffusion of Biotechnologies in Canada: Results from the Survey of Biotechnology Use in Canadian Industries
88F0017M2000008	Explaining Rapid Growth in Canadian Biotechnology Firms
88F0017M2001009	Internationally Comparable Indicators on Biotechnology: A Stocktaking, a Proposal for Work and Supporting Material
88F0017M2001010	Analysis of the Survey on Innovation, Advanced Technologies and Practices in the Construction and Related Industries, 1999

88F0017M2001011	Capacity to Innovate, Innovation and Impact: The Canadian Engineering Services Industry
88F0017M2001012	Patterns of Advanced Manufacturing Technology (AMT) Use in Canadian Manufacturing: 1998 AMT Survey Results

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### **Selected CANSIM tables from Statistics Canada**

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358-0001	Gross domestic expenditures on research and development, by science type and by funder and performer sector, annual
358-0024	Business enterprise research and development (BERD) characteristics, by industry group based on the North American Industry Classification System (NAICS), annual
358-0026	Intellectual property management, by federal departments and agencies indicators, annual

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### **Selected surveys from Statistics Canada**

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4201	Research and Development in Canadian Industry
4204	Research and Development of Canadian Private Non-Profit Organizations
4208	Provincial Research Organizations (PRO)
4209	Provincial Government Activities in the Natural Sciences
4212	Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences

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### **Selected summary tables from Statistics Canada**

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- *Research and development performed by the business enterprise sector*
- *Domestic spending on research and development (GERD), funding sector, by province*
- *Domestic spending on research and development (GERD), performing sector, by province*
- *Domestic spending on research and development (GERD)*

# Statistical tables

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**Table 1-1  
Gross domestic expenditures on research and development (GERD) in the health field — Compared to total GERD**

	Health research and development (R&D)		Population <sup>1</sup>	Health research and development (R&D) per capita	Gross domestic expenditures on research and development (GERD) <sup>2</sup>		Health research and development (R&D) by gross domestic expenditures on research and development (GERD)
	millions of current dollars	millions of 1997 current dollars <sup>3</sup>	thousands	dollars	millions of current dollars	millions of 1997 constant dollars <sup>3</sup>	percent
1989	1,365	1,585	27,282	50	9,516	11,052	14.3
1990	1,551	1,747	27,698	56	10,260	11,554	15.1
1991	1,665	1,820	28,031	59	10,767	11,767	15.5
1992	1,783	1,923	28,367	63	11,338	12,231	15.7
1993	2,006	2,134	28,682	70	12,184	12,962	16.5
1994	2,105	2,213	28,999	73	13,342	14,029	15.8
1995	2,196	2,259	29,302	75	13,754	14,150	16.0
1996	2,317	2,345	29,611	78	13,817	13,985	16.8
1997	2,447	2,447	29,907	82	14,634	14,634	16.7
1998	2,692	2,703	30,157	89	16,088	16,153	16.7
1999	2,967	2,929	30,404	98	17,637	17,411	16.8
2000 r	3,560	3,374	30,689	116	20,580	19,507	17.3
2001 r	4,170	3,908	31,021	134	23,169	21,714	18.0
2002 r	5,061	4,695	31,373	161	23,539	21,836	21.5
2003 r	5,192	4,661	31,676	164	24,337	21,846	21.3
2004 r	5,892	5,132	31,989	184	26,003	22,651	22.7
2005 e	6,174	5,210	32,299	191	27,174	22,932	22.7
2006 e	6,596	..	32,623	202	28,357	..	23.3

1. CANSIM table 051-0005.
2. Estimates of Canadian Research and Development Expenditures (GERD), Canada 1995 to 2006 and by province 1995 to 2004, no. 88F0006XIE2006009, September 2006 on CANSIM table 358-0001.
3. CANSIM table 384-0036.

Table 1-2

**Gross domestic expenditures on research and development (GERD) in the health field — Performing sector and funding sector**

	Federal government	Provincial governments	Business enterprise	Higher education <sup>1</sup>	Private non-profit	Foreign	Total
	millions of dollars						
<b>Performing sector</b>							
1989	50	22	233	980	80	...	1,365
1990	64	26	321	1,049	91	...	1,551
1991	55	29	324	1,156	101	...	1,665
1992	56	33	405	1,229	60	...	1,783
1993	53	29	490	1,367	67	...	2,006
1994	57	31	561	1,382	74	...	2,105
1995	63	33	593	1,428	79	...	2,196
1996	76	32	702	1,430	77	...	2,317
1997	78	32	749	1,516	72	...	2,447
1998	87	36	874	1,628	67	...	2,692
1999	103	32	961	1,823	48	...	2,967
2000	116	42	1,254	2,104	44	...	3,560
2001 r	152	42	1,542	2,383	51	...	4,170
2002 r	186	42	1,828	2,956	49	...	5,061
2003 r	196	44	1,807	3,087	58	...	5,192
2004 r	203	42	2,022	3,565	60	...	5,892
2005 e	212	47	2,082	3,772	61	...	6,174
2006 e	205	46	2,134	4,149	62	...	6,596
<b>Funding sector</b>							
1989	282	129	251	532	143	28	1,365
1990	334	145	333	558	152	29	1,551
1991	322	147	367	616	173	40	1,665
1992	317	149	442	670	138	67	1,783
1993	351	146	533	713	178	85	2,006
1994	354	148	581	721	200	101	2,105
1995	373	153	578	753	206	133	2,196
1996	347	143	632	754	239	202	2,317
1997	353	168	703	786	245	192	2,447
1998	381	171	794	864	244	238	2,692
1999	477	195	837	907	242	309	2,967
2000	560	233	1,054	1,000	285	428	3,560
2001 r	733	277	1,235	1,023	333	569	4,170
2002 r	957	309	1,427	1,283	390	695	5,061
2003 r	1,033	362	1,393	1,301	394	709	5,192
2004 r	1,092	363	1,534	1,586	460	857	5,892
2005 e	1,153	386	1,588	1,678	486	883	6,174
2006 e	1,238	418	1,653	1,846	533	908	6,596

1. Includes teaching hospitals.

**Table 1-3  
Gross domestic expenditures on research and development (GERD) in the health field — Higher education sector  
by funding sector, 2004**

	Federal government	Provincial governments	Business enterprise	Higher education <sup>1</sup>	Private non-profit	Foreign	Total
millions of dollars							
<b>Canada<sup>2</sup></b>	<b>875.0</b>	<b>311.7</b>	<b>325.9</b>	<b>1,585.1</b>	<b>428.1</b>	<b>38.3</b>	<b>3,564.1</b>
Newfoundland and Labrador	7.7	0.3	10.5	19.9	0.6	0.0	39.0
Prince Edward Island	1.8	0.1	0.0	1.8	0.0	0.0	3.7
Nova Scotia	23.8	2.4	15.9	43.7	17.1	0.0	102.9
New Brunswick	2.7	1.0	0.0	5.8	0.0	0.1	9.6
Quebec	278.2	95.4	63.4	364.2	92.0	7.5	900.7
Ontario	334.6	117.4	196.1	824.8	194.3	24.7	1,692.0
Manitoba	25.0	5.7	3.6	38.4	18.3	0.6	91.6
Saskatchewan	16.2	8.3	0.0	32.6	7.6	0.3	64.8
Alberta	76.2	69.5	27.6	142.4	33.2	2.2	351.1
British Columbia	108.7	11.6	8.8	111.5	65.1	3.2	308.8

1. Includes teaching hospitals.
2. Includes Yukon Territory, Northwest Territories and Nunavut.

**Table 1-4  
Gross domestic expenditures on research and development (GERD) in the health field — Higher education sector by provincial population, 2004**

	Population <sup>1</sup>	Health research and development (R&D)	Health research and development (R&D) per capita
	thousands	millions of dollars	dollars
<b>Canada<sup>2</sup></b>	<b>31,989</b>	<b>3,564</b>	<b>111</b>
Newfoundland and Labrador	517	39	75
Prince Edward Island	138	4	29
Nova Scotia	938	103	110
New Brunswick	752	9	12
Quebec	7,549	901	119
Ontario	12,417	1,692	136
Manitoba	1,170	91	78
Saskatchewan	995	65	65
Alberta	3,207	351	109
British Columbia	4,203	309	74

1. CANSIM table 051-0005.
2. Includes Yukon Territory, Northwest Territories and Nunavut.

**Table 1-5**  
**Gross domestic expenditures on research and development (GERD) in the health field — Historical**

	Performing sector					Total <sup>2</sup>
	Federal government	Provincial governments	Business enterprise	Higher education <sup>1</sup>	Private non-profit	
	millions of dollars					
<b>Funding sector</b>						
<b>2006 e</b>						
<b>Total <sup>2</sup></b>	<b>205</b>	<b>46</b>	<b>2,134</b>	<b>4,149</b>	<b>62</b>	<b>6,596</b>
Federal government	205	0	8	1,018	7	1,238
Provincial governments	0	46	1	363	8	418
Business enterprise	0	0	1,268	377	8	1,653
Higher education <sup>1</sup>	0	0	0	1,846	0	1,846
Private non-profit	0	0	1	501	31	533
Foreign	0	0	856	44	8	908
<b>2005 e</b>						
<b>Total <sup>2</sup></b>	<b>212</b>	<b>47</b>	<b>2,082</b>	<b>3,772</b>	<b>61</b>	<b>6,174</b>
Federal government	212	0	8	926	7	1,153
Provincial governments	0	47	1	330	8	386
Business enterprise	0	0	1,237	343	8	1,588
Higher education <sup>1</sup>	0	0	0	1,678	0	1,678
Private non-profit	0	0	1	455	30	486
Foreign	0	0	835	40	8	883
<b>2004 r</b>						
<b>Total <sup>2</sup></b>	<b>203</b>	<b>42</b>	<b>2,022</b>	<b>3,565</b>	<b>60</b>	<b>5,892</b>
Federal government	203	0	7	875	7	1,092
Provincial governments	0	42	1	312	8	363
Business enterprise	0	0	1,202	324	8	1,534
Higher education <sup>1</sup>	0	0	0	1,586	0	1,586
Private non-profit	0	0	1	430	29	460
Foreign	0	0	811	38	8	857
<b>2003 r</b>						
<b>Total <sup>2</sup></b>	<b>196</b>	<b>44</b>	<b>1,807</b>	<b>3,087</b>	<b>58</b>	<b>5,192</b>
Federal government	196	0	14	814	9	1,033
Provincial governments	0	44	2	306	10	362
Business enterprise	0	0	1,117	267	9	1,393
Higher education <sup>1</sup>	0	0	0	1,301	0	1,301
Private non-profit	0	0	0	369	25	394
Foreign	0	0	674	30	5	709

See footnotes at the end of the table.

Table 1-5 – continued

Gross domestic expenditures on research and development (GERD) in the health field — Historical

	Performing sector					Total <sup>2</sup>
	Federal government	Provincial governments	Business enterprise	Higher education <sup>1</sup>	Private non-profit	
	millions of dollars					
<b>Funding sector</b>						
<b>2002 r</b>						
<b>Total<sup>2</sup></b>	<b>186</b>	<b>42</b>	<b>1,828</b>	<b>2,956</b>	<b>49</b>	<b>5,061</b>
Federal government	186	0	15	752	4	957
Provincial governments	0	42	2	249	16	309
Business enterprise	0	0	1,157	261	9	1,427
Higher education <sup>1</sup>	0	0	0	1,283	0	1,283
Private non-profit	0	0	0	371	19	390
Foreign	0	0	654	40	1	695
<b>2001 r</b>						
<b>Total<sup>2</sup></b>	<b>152</b>	<b>42</b>	<b>1,542</b>	<b>2,383</b>	<b>51</b>	<b>4,170</b>
Federal government	152	0	12	564	5	733
Provincial governments	0	42	5	214	16	277
Business enterprise	0	0	991	236	8	1,235
Higher education <sup>1</sup>	0	0	0	1,023	0	1,023
Private non-profit	0	0	0	312	21	333
Foreign	0	0	534	34	1	569
<b>2000</b>						
<b>Total<sup>2</sup></b>	<b>116</b>	<b>42</b>	<b>1,254</b>	<b>2,104</b>	<b>44</b>	<b>3,560</b>
Federal government	116	0	8	433	3	560
Provincial governments	0	42	4	176	11	233
Business enterprise	0	0	835	211	8	1,054
Higher education <sup>1</sup>	0	0	0	1,000	0	1,000
Private non-profit	0	0	0	264	21	285
Foreign	0	0	407	20	1	428
<b>1999</b>						
<b>Total<sup>2</sup></b>	<b>103</b>	<b>32</b>	<b>961</b>	<b>1,823</b>	<b>48</b>	<b>2,967</b>
Federal government	103	0	6	362	6	477
Provincial governments	0	32	6	145	12	195
Business enterprise	0	0	665	167	5	837
Higher education <sup>1</sup>	0	0	0	907	0	907
Private non-profit	0	0	0	219	23	242
Foreign	0	0	284	23	2	309

See footnotes at the end of the table.



Table 1-5 – continued

## Gross domestic expenditures on research and development (GERD) in the health field — Historical

	Performing sector					Total <sup>2</sup>
	Federal government	Provincial governments	Business enterprise	Higher education <sup>1</sup>	Private non-profit	
	millions of dollars					
<b>Funding sector</b>						
<b>1998</b>						
<b>Total<sup>2</sup></b>	<b>87</b>	<b>36</b>	<b>874</b>	<b>1,628</b>	<b>67</b>	<b>2,692</b>
Federal government	87	0	9	275	10	381
Provincial governments	0	36	8	111	16	171
Business enterprise	0	0	641	145	8	794
Higher education <sup>1</sup>	0	0	0	864	0	864
Private non-profit	0	0	0	213	31	244
Foreign	0	0	216	20	2	238
<b>1997</b>						
<b>Total<sup>2</sup></b>	<b>78</b>	<b>32</b>	<b>749</b>	<b>1,516</b>	<b>72</b>	<b>2,447</b>
Federal government	78	0	8	261	6	353
Provincial governments	0	32	7	111	18	168
Business enterprise	0	0	559	134	10	703
Higher education <sup>1</sup>	0	0	0	786	0	786
Private non-profit	0	0	0	208	37	245
Foreign	0	0	175	16	1	192
<b>1996</b>						
<b>Total<sup>2</sup></b>	<b>76</b>	<b>32</b>	<b>702</b>	<b>1,430</b>	<b>77</b>	<b>2,317</b>
Federal government	76	0	10	255	6	347
Provincial governments	0	32	6	89	16	143
Business enterprise	0	0	505	118	9	632
Higher education <sup>1</sup>	0	0	0	754	0	754
Private non-profit	0	0	0	200	39	239
Foreign	0	0	181	14	7	202
<b>1995</b>						
<b>Total<sup>2</sup></b>	<b>63</b>	<b>33</b>	<b>593</b>	<b>1,428</b>	<b>79</b>	<b>2,196</b>
Federal government	63	0	9	294	7	373
Provincial governments	0	33	8	97	15	153
Business enterprise	0	0	458	105	15	578
Higher education <sup>1</sup>	0	0	0	753	0	753
Private non-profit	0	0	0	169	37	206
Foreign	0	0	118	10	5	133

1. Includes teaching hospitals.

2. Statistics Canada's estimate (due to unavailability of data by specific "Health Field").

# Estimates of total spending on R&D in the health field in Canada, 1989 to 2006

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Research and development (R&D) is a measure of a country's economic prosperity. Recently, our readers have expressed interest in the health field. How much R&D is Canada performing in the health field and who is funding this research? A methodology has been devised in order to estimate how much of the gross domestic expenditures on research and development (GERD) are relevant to health R&D. This paper presents details of expenditures on health R&D performance and funding.

## Definitions

### Research and development (R&D)

R&D is defined as creative work undertaken on a systematic basis in order to increase the stock of scientific and technical knowledge and the use of this knowledge to devise 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)

GERD represent all R&D performed in a country's national territory during a given year. The GERD includes R&D performed within a country and funded from abroad but excludes payments sent abroad for R&D performed in other countries.

## Methodology

**Federal government sector:** The health GERD figures include scientific activities aimed at protecting, promoting and restoring human health, broadly interpreted to include health aspects of nutrition and food hygiene. They range 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 paediatric and geriatric research.

Federal government R&D expenditures in the health field from 1989 until 2006<sup>e</sup> are derived from the survey of Federal Science Expenditures and Personnel. Data were collected from responses to a question on health as a socio-economic objective for Federal R&D spending. Federal government data are published in catalogue no. 88-204-X.

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

**Business enterprise sector:** The pharmaceutical and medicine manufacturing industry *North American Industry Classification System* (NAICS) 325410 is the most significant source of health R&D in the business enterprise sector. Other NAICS industries which are prevalent in health R&D include: pharmaceuticals and pharmacy supplies wholesale - distributors (414510), testing laboratories (541380), research and development in the physical, engineering and life sciences (541710) and health care and social assistance (NAICS 62) industries. Data originate from the R&D in Canadian industry survey conducted by Statistics Canada.

**The higher education sector:** Health R&D statistics are derived from Statistics Canada's revised higher education R&D estimates (catalogue no. 88-001-X vol. 30, no. 5) which identify R&D performed in the health field. The revised estimates are based on the assumption that the 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. Statistics Canada uses Canadian Association of University Business Officers (CAUBO) and Centre for Education Statistics data in order to compile the estimates.

Due to the nature of the estimation system for higher education research and development (HERD) statistics, higher education is the only sector of performance where a regional breakdown of health R&D is available.

**Private non-profit sector:** Values used for estimating health R&D expenditures in the private non-profit (PNP) sector are those identified as health-related in survey responses.