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Science Statistics

Estimates of Total
Spending on Research and
Development in the Health
Field in Canada, 1996 to 2007



July 2008 edition



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Science Statistics

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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

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Highlights

Research and development in the health field, 1996 to 2007 (preliminary)

- Spending on research and development (R&D) in the health field accounted for just over one-fifth of total spending on R&D last year, according to preliminary data (table 1-1).
- Spending on research and development in health is estimated to reach \$6.3 billion in 2007. This accounted for 21.8% of total R&D spending (table 1-1).
- The higher education sector remained the most important sector conducting health R&D, performing an estimated \$4.1 billion worth in 2007. The business enterprise sector, in second place, dedicated \$1.9 billion (table 1-2).
- These two sectors accounted for the vast majority of work performing health R&D. They were also the leading funding sectors for health R&D, accounting for just over one-half of the funds dedicated to health in 2007 (table 1-2).
- The federal government was still the third most important funding sector for health R&D, accounting for one-fifth of the funds invested in this field.
- The private non-profit sector contributed slightly over \$500 million, while foreign funders invested just over \$800 million (table 1-2).
- On a per capita basis, health R&D spending increased from \$163 in 2003 to an estimated \$192 in 2007 (table 1-1).

Analysis

Estimates of total spending on research and development (R&D) in the health field in Canada, 1996 to 2007

Spending on health related R&D is projected to reach \$6.3 billion in 2007 up by \$227 million (3.7%) over the previous year (table 1-1).

Health R&D spending is an important component of the national R&D effort estimated to represent one fifth (21.8%) of total R&D spending in 2007 (table 1-1).

Health R&D spending per capita increased from \$163 in 2003 to an estimated \$192 for 2007 (table 1-1).

In constant dollars, 2007 investment in health R&D is expected to grow after registering a decline between 2005 and 2006 (table 1-1).

Performing an estimated \$4.1 billion of health R&D in 2007, the higher education sector remained the most important performing sector for health R&D with the business enterprise sector dedicating the second highest amount at \$1.9 billion (table 1-2).

Detailed information on funding sectors for the major component of health R&D spending, the higher education sector, is only available until 2005 (table 1-3).

Universities and teaching hospitals continued to be important funding agents of health R&D performed in the higher education sector funding \$1.6 billion of the \$3.8 billion R&D performed by higher education institutions in 2005 (table 1-3).

The federal government at \$990 million was the second most important funding sector of health R&D performed by the higher education sector in 2005 (table 1-3).

The higher education sector was the performing sector of choice for the private non-profit sector that dedicated \$464 million of its total \$483 million health R&D funding to university and teaching hospital research (tables 1-2 and 1-3).

Provincial distribution of the health R&D performed by the higher education sector is only available until 2005 (table 1-4).

In 2005, health R&D spending per capita for the higher education sector was \$116 with Ontario registering the highest per capita health R&D spending by universities and teaching hospitals at \$138. Quebec followed at \$128 per capita spending on health R&D by the higher education sector (table 1-4).

Related products

Selected publications from Statistics Canada

| | |
|----------|--|
| 88-202-X | Industrial Research and Development: Intentions |
| 88-204-X | Federal Scientific Activities |
| 88-221-X | Gross Domestic Expenditures on Research and Development in Canada and the Provinces |
| 88-522-X | Science and Technology Activities and Impacts: A Framework for a Statistical Information |
| 88F0006X | Science, Innovation and Electronic Information Division Working Papers |
| 88F0017M | Science, Innovation and Electronic Information Division Research Papers |

Selected CANSIM tables from Statistics Canada

| | |
|----------|---|
| 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 |

Selected surveys from Statistics Canada

| | |
|------|--|
| 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 |
| 4210 | Provincial Government Activities in the Social Sciences |
| 4212 | Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences |
| 5109 | Higher Education Research and Development Estimates |

Selected summary tables from Statistics Canada

- *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

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

| | Health research and development ¹ | Population ² | Health research and development per capita | Gross domestic expenditures on research and development ³ | Health research and development by gross domestic expenditures on research and development | | |
|--------|--|--|--|--|--|---------|------|
| | millions of current dollars | millions of 2002 constant dollars ⁴ | thousands | millions of current dollars | millions of 2002 constant dollars ⁴ | percent | |
| 2003 r | 5,168 | 5,003 | 31,775 | 163 | 24,635 | 23,848 | 21.0 |
| 2004 r | 5,926 | 5,559 | 32,096 | 185 | 26,480 | 24,841 | 22.4 |
| 2005 r | 6,128 | 5,561 | 32,422 | 189 | 27,699 | 25,135 | 22.1 |
| 2006 e | 6,084 | 5,394 | 32,755 | 186 | 28,067 | 24,882 | 21.7 |
| 2007 e | 6,311 | 5,422 | 32,799 | 192 | 28,984 | 24,900 | 21.8 |

1. As of 2004, there are no longer estimates for Saskatchewan included in the total health research and development.
2. CANSIM table 051-0005.
3. Estimates of Canadian Research and Development Expenditures (GERD), Canada 1996 to 2007 and by province 1996 to 2005, no. 88F0006XIE2006009, on CANSIM table 358-0001.
4. 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 ¹ government | Provincial ² governments | Business enterprise | Higher ³ education | Private non-profit | Foreign | Total |
|--------------------------|------------------------------------|--|------------------------|----------------------------------|-----------------------|---------|--------------|
| | millions of dollars | | | | | | |
| Performing sector | | | | | | | |
| 2003 r | 196 | 29 | 1,798 | 3,087 | 58 | ... | 5,168 |
| 2004 r | 203 | 31 | 2,045 | 3,585 | 62 | ... | 5,926 |
| 2005 r | 210 | 30 | 2,060 | 3,770 | 58 | ... | 6,128 |
| 2006 e | 218 | 33 | 1,881 | 3,893 | 59 | ... | 6,084 |
| 2007 e | 214 | 34 | 1,931 | 4,072 | 60 | ... | 6,311 |
| Funding sector | | | | | | | |
| 2003 r | 1,031 | 348 | 1,386 | 1,301 | 393 | 709 | 5,168 |
| 2004 r | 1,093 | 353 | 1,526 | 1,606 | 458 | 890 | 5,926 |
| 2005 r | 1,232 | 330 | 1,573 | 1,629 | 483 | 881 | 6,128 |
| 2006 e | 1,271 | 343 | 1,478 | 1,682 | 499 | 811 | 6,084 |
| 2007 e | 1,315 | 357 | 1,525 | 1,760 | 521 | 833 | 6,311 |

1. Non-program cost (indirect costs) are excluded.
2. The provincial totals represent the following surveyed provinces: Alberta, British Columbia, Manitoba, Ontario and Quebec (a survey of only research and development statistics is conducted by the Institut de la Statistique du Québec and shared with Statistics Canada). As of 2000, The Centre for Addiction and Mental Health is reported under the higher education sector.
3. Includes teaching hospitals.

Table 1-3
Gross domestic expenditures on research and development (GERD) in the health field — Higher education sector by funding sector, 2005

| | Federal government | Provincial governments | Business enterprise | Higher ¹ education | Private non-profit | Foreign | Total |
|---------------------------|--------------------|------------------------|---------------------|-------------------------------|--------------------|-------------|----------------|
| millions of dollars | | | | | | | |
| Canada | 990.1 | 292.0 | 348.3 | 1,629.4 | 464.4 | 46.5 | 3,770.7 |
| Newfoundland and Labrador | 10.9 | 0.4 | 14.7 | 27.5 | 0.5 | 0.7 | 54.6 |
| Prince Edward Island | 2.6 | 0.1 | 0.0 | 2.1 | 0.0 | 0.0 | 4.8 |
| Nova Scotia | 24.5 | 1.8 | 20.4 | 48.8 | 16.5 | 0.0 | 112.0 |
| New Brunswick | 3.0 | 1.1 | 0.0 | 6.8 | 0.0 | 0.0 | 10.9 |
| Quebec | 305.2 | 78.1 | 79.1 | 409.5 | 90.0 | 11.3 | 973.1 |
| Ontario | 403.7 | 120.7 | 187.0 | 768.9 | 233.8 | 26.8 | 1,740.8 |
| Manitoba | 24.7 | 4.6 | 4.2 | 48.0 | 23.9 | 0.8 | 106.2 |
| Saskatchewan | 14.3 | 6.0 | 0.0 | 32.9 | 8.8 | 0.2 | 62.1 |
| Alberta | 92.0 | 54.8 | 30.8 | 167.4 | 39.4 | 2.9 | 387.2 |
| British Columbia | 109.4 | 24.4 | 12.1 | 117.5 | 51.5 | 4.0 | 319.0 |

1. Includes teaching hospitals.

Table 1-4
Gross domestic expenditures on research and development (GERD) in the health field — Higher education sector by provincial population, 2005

| | Population ¹ | Health research and development | Health research and development per capita |
|---------------------------|-------------------------|---------------------------------|--|
| | thousands | millions of dollars | dollars |
| Canada² | 32,422 | 3,771 | 116 |
| Newfoundland and Labrador | 514 | 55 | 107 |
| Prince Edward Island | 138 | 5 | 36 |
| Nova Scotia | 936 | 112 | 120 |
| New Brunswick | 751 | 11 | 15 |
| Quebec | 7,616 | 973 | 128 |
| Ontario | 12,616 | 1,741 | 138 |
| Manitoba | 1,175 | 106 | 90 |
| Saskatchewan | 990 | 62 | 63 |
| Alberta | 3,303 | 387 | 117 |
| British Columbia | 4,280 | 319 | 75 |

1. CANSIM table 051-0005.

2. Includes the population of 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 ² |
|-------------------------------|---------------------|------------------------|---------------------|-------------------------------|--------------------|--------------------|
| | Federal government | Provincial governments | Business enterprise | Higher ¹ education | Private non-profit | |
| | millions of dollars | | | | | |
| Funding sector | | | | | | |
| 2007 e | | | | | | |
| Total² | 214 | 34 | 1,931 | 4,072 | 60 | 6,311 |
| Federal government | 214 | 0 | 12 | 1,069 | 20 | 1,315 |
| Provincial governments | 0 | 34 | 1 | 315 | 7 | 357 |
| Business enterprise | 0 | 0 | 1,144 | 376 | 5 | 1,525 |
| Higher education ¹ | 0 | 0 | 0 | 1,760 | 0 | 1,760 |
| Private non-profit | 0 | 0 | 1 | 501 | 19 | 521 |
| Foreign | 0 | 0 | 773 | 51 | 9 | 833 |
| 2006 e | | | | | | |
| Total² | 218 | 33 | 1,881 | 3,893 | 59 | 6,084 |
| Federal government | 218 | 0 | 12 | 1,022 | 19 | 1,271 |
| Provincial governments | 0 | 33 | 1 | 302 | 7 | 343 |
| Business enterprise | 0 | 0 | 1,114 | 359 | 5 | 1,478 |
| Higher education ¹ | 0 | 0 | 0 | 1,682 | 0 | 1,682 |
| Private non-profit | 0 | 0 | 1 | 479 | 19 | 499 |
| Foreign | 0 | 0 | 753 | 49 | 9 | 811 |
| 2005 r | | | | | | |
| Total² | 210 | 30 | 2,060 | 3,770 | 58 | 6,128 |
| Federal government | 210 | 0 | 13 | 990 | 19 | 1,232 |
| Provincial governments | 0 | 30 | 1 | 292 | 7 | 330 |
| Business enterprise | 0 | 0 | 1,220 | 348 | 5 | 1,573 |
| Higher education ¹ | 0 | 0 | 0 | 1,629 | 0 | 1,629 |
| Private non-profit | 0 | 0 | 1 | 464 | 18 | 483 |
| Foreign | 0 | 0 | 825 | 47 | 9 | 881 |
| 2004 r | | | | | | |
| Total² | 203 | 31 | 2,045 | 3,585 | 62 | 5,926 |
| Federal government | 203 | 0 | 7 | 875 | 8 | 1,093 |
| Provincial governments | 0 | 31 | 1 | 312 | 9 | 353 |
| Business enterprise | 0 | 0 | 1,192 | 326 | 8 | 1,526 |
| Higher education ¹ | 0 | 0 | 0 | 1,606 | 0 | 1,606 |
| Private non-profit | 0 | 0 | 1 | 428 | 29 | 458 |
| Foreign | 0 | 0 | 844 | 38 | 8 | 890 |

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 ² |
|-------------------------------|---------------------|------------------------|---------------------|-------------------------------|--------------------|--------------------|
| | Federal government | Provincial governments | Business enterprise | Higher ¹ education | Private non-profit | |
| | millions of dollars | | | | | |
| Funding sector | | | | | | |
| 2003 r | | | | | | |
| Total² | 196 | 29 | 1,798 | 3,087 | 58 | 5,168 |
| Federal government | 196 | 0 | 12 | 814 | 9 | 1,031 |
| Provincial governments | 0 | 29 | 2 | 306 | 11 | 348 |
| Business enterprise | 0 | 0 | 1,110 | 267 | 9 | 1,386 |
| Higher education ¹ | 0 | 0 | 0 | 1,301 | 0 | 1,301 |
| Private non-profit | 0 | 0 | 0 | 369 | 24 | 393 |
| Foreign | 0 | 0 | 674 | 30 | 5 | 709 |
| 2002 r | | | | | | |
| Total² | 186 | 30 | 1,826 | 2,956 | 49 | 5,047 |
| Federal government | 186 | 0 | 15 | 752 | 5 | 958 |
| Provincial governments | 0 | 30 | 2 | 249 | 16 | 297 |
| Business enterprise | 0 | 0 | 1,155 | 261 | 9 | 1,425 |
| Higher education ¹ | 0 | 0 | 0 | 1,283 | 0 | 1,283 |
| Private non-profit | 0 | 0 | 0 | 371 | 18 | 389 |
| Foreign | 0 | 0 | 654 | 40 | 1 | 695 |
| 2001 r | | | | | | |
| Total² | 152 | 29 | 1,542 | 2,383 | 51 | 4,157 |
| Federal government | 152 | 0 | 12 | 564 | 5 | 733 |
| Provincial governments | 0 | 29 | 5 | 214 | 16 | 264 |
| Business enterprise | 0 | 0 | 991 | 236 | 8 | 1,235 |
| Higher education ¹ | 0 | 0 | 0 | 1,023 | 0 | 1,023 |
| Private non-profit | 0 | 0 | 0 | 312 | 21 | 333 |
| Foreign | 0 | 0 | 534 | 34 | 1 | 569 |
| 2000 | | | | | | |
| Total² | 116 | 26 | 1,253 | 2,104 | 44 | 3,543 |
| Federal government | 116 | 0 | 7 | 433 | 3 | 559 |
| Provincial governments | 0 | 26 | 4 | 176 | 12 | 218 |
| Business enterprise | 0 | 0 | 835 | 211 | 8 | 1,054 |
| Higher education ¹ | 0 | 0 | 0 | 1,000 | 0 | 1,000 |
| Private non-profit | 0 | 0 | 0 | 264 | 20 | 284 |
| Foreign | 0 | 0 | 407 | 20 | 1 | 428 |

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 ² |
|-------------------------------|---------------------|------------------------|---------------------|-------------------------------|--------------------|--------------------|
| | Federal government | Provincial governments | Business enterprise | Higher ¹ education | Private non-profit | |
| | millions of dollars | | | | | |
| Funding sector | | | | | | |
| 1999 | | | | | | |
| Total² | 103 | 31 | 961 | 1,823 | 48 | 2,966 |
| Federal government | 103 | 0 | 6 | 362 | 6 | 477 |
| Provincial governments | 0 | 31 | 6 | 145 | 12 | 194 |
| Business enterprise | 0 | 0 | 665 | 167 | 5 | 837 |
| Higher education ¹ | 0 | 0 | 0 | 907 | 0 | 907 |
| Private non-profit | 0 | 0 | 0 | 219 | 23 | 242 |
| Foreign | 0 | 0 | 284 | 23 | 2 | 309 |
| 1998 | | | | | | |
| Total² | 87 | 36 | 874 | 1,628 | 67 | 2,692 |
| 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 ¹ | 0 | 0 | 0 | 864 | 0 | 864 |
| Private non-profit | 0 | 0 | 0 | 213 | 31 | 244 |
| Foreign | 0 | 0 | 216 | 20 | 2 | 238 |
| 1997 | | | | | | |
| Total² | 78 | 32 | 749 | 1,516 | 72 | 2,447 |
| 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 ¹ | 0 | 0 | 0 | 786 | 0 | 786 |
| Private non-profit | 0 | 0 | 0 | 208 | 37 | 245 |
| Foreign | 0 | 0 | 175 | 16 | 1 | 192 |
| 1996 | | | | | | |
| Total² | 76 | 32 | 701 | 1,430 | 77 | 2,316 |
| Federal government | 76 | 0 | 9 | 255 | 6 | 346 |
| Provincial governments | 0 | 32 | 6 | 89 | 16 | 143 |
| Business enterprise | 0 | 0 | 505 | 118 | 9 | 632 |
| Higher education ¹ | 0 | 0 | 0 | 754 | 0 | 754 |
| Private non-profit | 0 | 0 | 0 | 200 | 39 | 239 |
| Foreign | 0 | 0 | 181 | 14 | 7 | 202 |

1. Includes teaching hospitals.

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

Data quality, concepts and methodology

Estimates of total spending on research and development in the health field in Canada, 1996 to 2007

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

Research and experimental development comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

The central characteristic of R&D is an appreciable element of novelty and of uncertainty. New knowledge, products or processes are sought. New knowledge involves the integration of newly acquired information into existing hypotheses, the formulation and testing of new hypotheses or the re-evaluation of existing observations.

An R&D project generally has three characteristics:

- substantial element of uncertainty, novelty and innovation;
- well-defined project design;
- report on the procedures and results of the projects.

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 1996 until 2007^e 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 government: 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. Provincial government data are published in Catalogue No. 88-001-X Vol. 31, No. 5.

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. Business enterprise data are published in "Industrial research and development: Intentions", Catalogue No. 88-202-X.

The higher education sector: Health R&D statistics are derived from Statistics Canada's revised higher education R&D estimates (STC Catalogue 88-001-X Vol. 31, No. 4) 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.