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The Health Enterprise Charting a Path for Health Innovation

At a Glance

- ◆ Innovation that reduces the growth rate of health-care costs, while raising productivity and improving health outcomes, is the best option for keeping Canada's health-care system sustainable.
- ◆ Health education and research institutions, health and life sciences industries, health and health-care organizations and professionals, and governments (the "health enterprise") play a major role in Canada's health innovation systems.
- ◆ Health innovation policies and strategies need to be designed and implemented to ensure all members of the health enterprise will work in synchronicity to attain set targets.

INTRODUCTION

The federal government and some of the provinces recognize that health and life sciences are strategic areas that should be supported. Paradoxically, we still lack the comprehensive strategies to nurture and protect these sciences. We recognize the challenges of creating such strategies in a country where the federal government has seen a decade of growing surpluses, and the provinces have had difficulty maintaining balanced books—mainly due to escalating health-care costs.

This year, Canada's health-care system is forecast to consume 11.9 per cent of our economic output (gross

domestic product)¹ and health-care costs are poised to increase further. The increase is mainly driven by the rising prevalence of chronic diseases and demand for health services (related to increased patient expectations and aging), new technologies, and health human resources. Increases in health-care costs over the past few years are of concern. That is because the growth of Canada's economy was only 64 per cent of the growth of health-care costs. The recent economic recession has made this mismatch even more astounding now. As a result of this year's shrinking economy, total health-care spending as a percentage of GDP jumped from an estimated 10.8 per cent in 2008 to an estimated 11.9 per cent in 2009. Even if economic growth returns to pre-recession levels by next year, this mismatch will have a far-reaching effect. Canadians who are now 60 years of age can expect to see health care consume almost 15 per cent of GDP—in contrast to the 2008 share of 10.8 per cent—when they turn 75. This is worrisome in light of current economic conditions.

Despite the current high expenditure levels in the health-care system, the health of Canada's population is less than optimal.

The recent economic turmoil and the price of economic recovery are so great that they will likely limit the availability of health-care dollars. As economic growth is expected to decline by approximately 3 per cent this year, there will be much less money available to cover increasing health-care costs.

In August 2009, The Conference Board of Canada said this about budgets, health costs, and debt:

In 2009, all levels of government will publish a combined deficit of over \$75 billion (on a national income accounts basis). This number will rise to almost \$83 billion in 2010. These deficits will severely constrain policy options over the foreseeable future as governments

struggle to rebalance their books. The implication is that, sooner or later, provinces will have to boost taxes and cut spending in order to return to a balanced budget.²

But despite current high expenditures in the system, the health of Canada's population is less than optimal. For example, when compared with other developed Organisation for Economic Co-operation and Development (OECD) countries, Canada shows the third highest rate of mortality due to diabetes, and the second highest rate of infant mortality.³ Innovation that reduces the growth rate of health-care costs, while raising productivity and improving health outcomes, is the best option for keeping Canada's health-care system sustainable.

A highly fragmented vision, structures, policies, and incentives are preventing Canada from delivering better health outcomes to its population.

Where will all this needed innovation come from? Canada has the talent, the energy, and the scientific knowledge to have the best health-care system in the world. As with any other sector of the economy, health care should meet the highest international standards to deliver the most efficient and modern products and services. However, a highly fragmented vision, structures, policies, and incentives—which tend to focus on short-term rather than long-term results—are preventing Canada from reaching its potential and delivering better outcomes to its population. Without a strong health-system performance, there will be significant economic, personal, and population losses.

Productivity and the growth and strength of the economy depend in part on population health and the health-care system. This policy briefing will introduce the vision for a health enterprise—an approach that proposes

1 Canadian Institute for Health Information, *National Health Expenditure Trends—1975 to 2009* (Ottawa: Canadian Institute for Health Information, 2009).

2 The Conference Board of Canada, *Provincial Outlook Executive Summary: Climbing Out of Recession* (Ottawa: The Conference Board of Canada, 2009).

3 The Conference Board of Canada, *How Canada Performs* [online]. (2009), [cited September 2009]. www.conferenceboard.ca/HCP/Details/Health.aspx.

alignment and integration of key sectors affecting health-care performance. It will also present a Health Innovation Framework for Action that can guide the design and implementation of policies that support the improvement of health outcomes—boosting national capacity for innovation and strengthening Canada’s global position in the knowledge economy. Research methods used to create this policy briefing included a review of relevant articles and reports. It is also based on several discussions among members and guests of the Centre for the Advancement of Health Innovations, a joint initiative between the Conference Board of Canada and the Canadian Health Industries Partnership.

WHAT DO WE KNOW ABOUT INNOVATION?

Evidence shows a strong relationship between innovation, productivity, and economic prosperity. Innovation is fundamental for productivity growth, and increases in productivity lead to long-term economic prosperity.^{4, 5} According to the recently published Annual Global CEO Survey by PricewaterhouseCoopers, 92 per cent of CEOs recognize that innovation is a “...critical ingredient for long-term survival”⁶ in any industry. The same ideas also apply to nations. The widespread recognition that ideas and knowledge are as important as capital and labour in modern societies has led the European Union to set the ambitious target of increasing research and development (R&D) to 3 per cent of GDP in its member nations by 2010.⁷

But, as was recognized by the Organization of American States in its Fifth Summit of the Americas, economic prosperity also supports human prosperity, which

Innovation

Innovation is a process that extracts economic and social values from knowledge using the generation, development, and implementation of ideas to produce new or improved products, services, or processes.

Source: The Conference Board of Canada.

includes improvements in health, education, and basic social services, and decreases in social disparities and inequities.⁸ All these elements combined lead to happier and more engaged societies. Therefore, we can infer that innovation, productivity, and prosperity (particularly in the health and life sciences sectors, which include health care, education, research, and industry), are important contributors not only to the health status of the population, but also to the well-being of societies. (See Exhibit 1.)

REBALANCING THE HEALTH-CARE PICTURE: A COST SINK OR VALUE GENERATOR?

The health-care system does not exist on its own, disconnected from the rest of the economy. On the contrary, as one of the three biggest recipients of public revenues, health care plays an integral role in national economic performance. While most people are generally aware of the cost of health care, the argument for its benefits is rarely made. See box “The Economic Benefits of Life Expectancy Gains,” which illustrates the economic value of health research and health care.

A recent report from the United Kingdom also highlighted the value of medical research.⁹ It found that public investments in cardiovascular research in the U.K.—conducted from 1975 to 1992—yielded returns of about 39 per cent;

4 California Regional Economies Project, *Innovation, Productivity and California’s Prosperity* [online]. (September 2004), [cited September 2009]. www.coecon.com/Reports/ARCHIVES/ECONOMY/InnovProdProsp.pdf.

5 Task Force on Competitiveness, Productivity and Economic Progress, *Leaning Into the Wind, 7th Annual Report* [online]. (November 2008), [cited August 2009]. www.competeprosper.ca/index.php/media/press_releases/task_force_releases_seventh_annual_report.

6 PricewaterhouseCoopers, “Annual Global CEO Survey” [online]. (2009), [cited August 2009]. www.pwc.com/ca/en/media/release/2009-02-24-automotive-ceo-survey.jhtml.

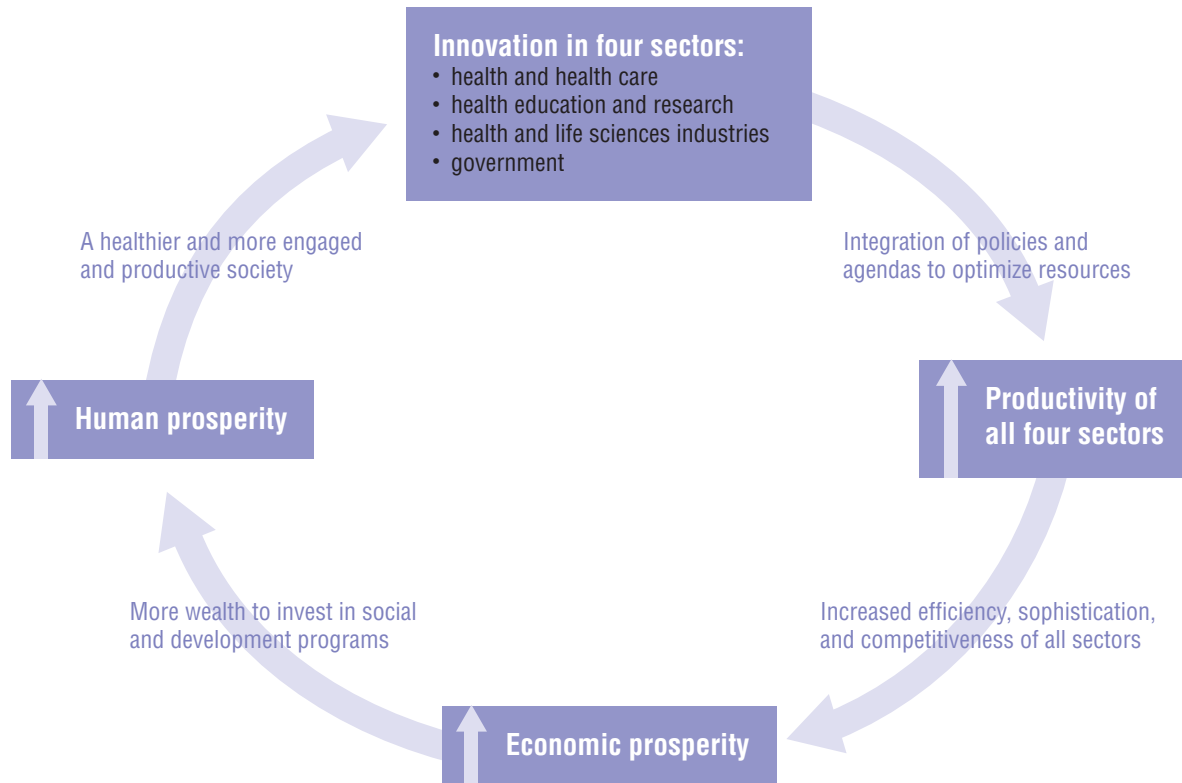
7 Angel Gurría, OECD Secretary General, “Introductory Remarks,” *OECD Forum 2007*. Forum held at Paris, May 14, 2007.

8 Organization of American States, *Securing Our Citizens’ Future by Promoting Human Prosperity, Energy Security and Environmental Sustainability* [online]. (April 2009), [cited September 2009]. www.summit-americas.org/V_Summit/decl_commm_pos_en.pdf.

9 Brunel University Health Economics Research Group et al., *Medical Research: What’s It Worth? Estimating the Economic Benefits From Medical Research in the U.K.* [online]. (November 2008), [cited November 2009]. www.wellcome.ac.uk/stellent/groups/corporatesite/@sitestudioobjects/documents/web_document/wtx052110.pdf.

Exhibit 1

Contributions of Innovations in Health to Human Prosperity



Source: The Conference Board of Canada.

i.e., for each £1 invested in public cardiovascular research, the U.K. earned £0.39 per year in perpetuity. This impressive rate of return is rarely offered by any other enterprise. Therefore, health research and development that lead to health innovations—appropriately and timely integrated into health and health-care systems—actually create more value than they consume. A significant proportion of this value is translated into national productivity.

The health-care system is an integral part of our national productivity growth, and innovation is the key to the system's sustainability.

Like other services that knit Canada together (the transportation system, the communications networks, etc.), Canada's health-care services touch the life of every

Canadian. The health-care system acts as the guardian and defender of the state of public health and is a major factor in the productivity of the workforce. It is also a major consumer of technology and an employer of scientists, engineers, and medical specialists. Therefore, the health-care system has a major influence on the careers of highly qualified professionals. The system is a pillar of Canadian science and technology research because the advanced research it underwrites and performs touches not only on disease but also on our deep understanding of biology and matter. One can readily say that the Canadian health-care system is at the heart of Canada's national innovation system, both as a contributor of inputs and as an attractor or demander of its outputs. Like the other major systems of national life, it is an integral part of the national productivity growth problem. And, like the other systems, innovation is the key to its sustainability.

The Economic Benefits of Life Expectancy Gains

At the turn of the 20th century, an individual had a life expectancy of 50 years. In 1961, the average Canadian could expect to live to age 71, and in 2006, the estimated average life expectancy in Canada was 80 years. This represents an impressive gain of 30 years of life over one century. These health gains represent the benefits of improvements in determinants of health (e.g., education levels and income) but also in health advancements that were the product of research and innovation properly translated into health-care services. These impressive gains in average life expectancy represent an additional economic output of trillions of dollars that exceeds health research and health-care costs over the same period by orders of magnitude. For example, research conducted in the United States—to measure the value of improvements in health and longevity—found that historical improvements in life expectancy have been very valuable. Life expectancy gains in 1970–2000 were estimated to be worth US\$95 trillion (US\$3.2 trillion per year).¹ And potential future gains are also very large. For example, according to the study, curing cancer is worth about \$47 trillion to the U.S. Further improvements in the treatment of cancer and cardiovascular diseases are estimated to bring additional value in the magnitude of billions of dollars.

Current Value of a 10 Per Cent Reduction in Mortality From Major Diseases (US\$ trillions)

| Major cause of death | Males | Females | Total |
|------------------------------|--------------|-------------|--------------|
| All causes | 10.70 | 7.90 | 18.60 |
| Cardiovascular diseases | 3.30 | 2.50 | 5.80 |
| Cancer | 2.40 | 2.30 | 4.70 |
| Diabetes | 0.24 | 0.25 | 0.49 |
| Infectious diseases | 0.50 | 0.15 | 0.65 |
| Accidents and adverse events | 0.98 | 0.42 | 1.40 |

Notes: Figures are based on 2004 statistics and rounded to the nearest decimal. The values of other mortality causes were also estimated in the study, but not included in this table. Therefore, the totals of the major causes listed here do not add up to the totals in “All causes.”

Source: Adapted from Kevin Murphy and Robert Topel, *The Value of Health Advances* (Chicago: University of Chicago Press, 2006). Data presented at the Centre for the Advancement of Health Innovations meeting at Montréal, January 2009.

1 Kevin Murphy and Robert Topel, *Measuring the Gains from Medical Research—An Economic Approach* (Chicago: University of Chicago Press, 2003).

R&D investments are expected to result in the creation of knowledge, and higher levels of expenditure are expected to yield better results. Gross Domestic Expenditures on Research and Development (GERD)¹⁰ have decreased in the health field in Canada since 2004, with spending on health research per capita falling from \$191 to an estimated \$184 in 2008. (See Table 1.) Considering the consequences experienced by organizations and industries due to lack of innovation, the current state of R&D investment in the health-care field should be seen as a warning sign for the industry’s future performance. Is Canada jeopardizing its ability to innovate in its health and health-care sectors? What would the likely social and health consequences be?

WHAT DO WE KNOW ABOUT INNOVATION IN CANADA?

Innovation is critical to a high-performing economy and Canada has the potential to become a global leader in health innovations. It has world-class researchers and entrepreneurs who show remarkable creativity. Canada also has a long history of innovation and government has done much to facilitate this. In its 2009 budget, the federal government supported its science and innovation strategy by pledging funding of \$750 million for research infrastructure (through the Canada Foundation for Innovation). The government also dedicated \$2 billion to upgrade and expand facilities at post-secondary institutions.¹¹ Numerous studies have been undertaken in the last 10 years to better understand innovation in Canada.¹² These studies have highlighted Canada’s strengths and weaknesses, and have made important recommendations to improve our country’s competitiveness and retain our highly valued standard of living. What have we learned from these studies?

10 Refers to all monies expended for research and development performed within the country in a given year.

11 Department of Finance, *Budget 2009—Budget in Brief* [online]. (2009), [cited September 2009]. www.budget.gc.ca/2009/glance-apercu/brief-bref-eng.asp.

12 For a complete list of the publications reviewed, please refer to Appendix A.

Table 1
Gross Domestic Expenditures on Research and Development

| Year | Population ² (thousands) | Health research and development ¹ | | | (Per cent, as a proportion of GERD) | GERD ³ (Current \$ millions) ⁴ |
|-------|--|--|-----------------------|--------------|---|--|
| | | (Current \$ millions) | (2002 \$ millions) | (Per capita) | | |
| 2004r | 32,038 | 6.1 | 5.7 | 191 | 23 | 26.8 |
| 2005r | 32,353 | 6.3 | 5.7 | 195 | 22 | 28.1 |
| 2006r | 32,688 | 6.0 | 5.3 | 184 | 21 | 28.7 |
| 2007e | 33,047 | 6.1 | 5.2 | 185 | 21 | 28.8 |
| 2008e | 33,441 | 6.2 | n.a. | 184 | 21 | 28.1 |

1. As of 2004, estimates for Saskatchewan are no longer included in the total health research and development.

2. CANSIM, Table 051-0005.

3. Estimates of the Canadian Gross Domestic Expenditures on Research and Development (GERD), Canada 1996–2007, and by province, 1996–2005. No. 88F0006XIE2006009 on CANSIM, Table 358-0001.

4. CANSIM, Table 384-0036.

e = estimate; r = revised

Note: Dollars are rounded to the nearest decimal.

Source: Statistics Canada.

CANADA'S STRENGTHS

Canada's strengths are numerous, but at the forefront are strong government support of R&D, the establishment of research granting councils, and the provision of tax credits. Various studies show that Canada's greatest strengths are in technologies and sciences related to natural resources; information and communication technologies (ICTs), particularly in nanotechnologies; new ICT-enabled services (such as e-commerce and e-health); and health sciences and biotechnologies.¹³ Some of the studies reviewed stated that Canada is well-positioned to be a global leader in clean energy technologies, followed by health-care technologies. These ideas were later acknowledged by the federal government in its national innovation strategy.¹⁴

CANADA'S CHALLENGES

Yet Canada remains near the bottom of its peer group on innovation. In its last innovation report card, The Conference Board of Canada gave Canada a "D" on innovation, with a 14th place standing in the 17-country comparator group. This does not mean that Canadian inventions are themselves inferior. In fact, Canada produces some great inventions and inventors.¹⁵ Canada's relatively low ranking means that, as a proportion of its overall economic activity, Canada does not rely on innovation as much as some of its peers do. Canada also performs poorly according to the OECD's 2007 Science and Technology Scoreboard, where it trailed many of its peers and fell below the OECD average.¹⁶ In this OECD study, Canada scored 18 out of 35 in the annual average growth rate of GERD for 1995–2005.

13 Council of Canadian Academies: Committee on the State of Science and Technology in Canada, *The State of Science and Technology in Canada* [online]. (September 2006), [cited August 2009]. www.scienceadvice.ca/study.html.

14 Industry Canada, *Mobilizing Science and Technology to Canada's Advantage* [online]. (2007), [cited August 2009]. [www.ic.gc.ca/eic/site/ic1.nsf/vwapj/S&Tstrategy.pdf/\\$file/S&Tstrategy.pdf](http://www.ic.gc.ca/eic/site/ic1.nsf/vwapj/S&Tstrategy.pdf/$file/S&Tstrategy.pdf).

15 Association of Canadian Academic Healthcare Organizations, *Eureka! World's First Discoveries and Other Major Medical Breakthroughs in ACAHO Member Institutions* [online]. (March 2008), [cited October 2009]. www.achao.org/docs_new/ACHAO%20Policy%20Documents/Eureka!/EurekaFinalMarch08.pdf.

16 OECD, *OECD Science, Technology and Industry Scoreboard* [online]. (2007), [cited August 2009]. www.oecd.org/document/10/0,3343,en_2649_33703_39493962_1_1_1_1,00.html#web.

The numerous reports that document Canada's strengths also point out critical weaknesses that hamper Canada's capacity to support innovation—both nationally and in specific sectors such as health and life sciences. Key among those are:

- ♦ **Shortages of skilled workers**, such as researchers and entrepreneurs, who drive innovation.¹⁷ Canada has world-class researchers, but not in large numbers. Canada has demonstrated low growth in the number of graduates with health-related, advanced, research qualifications per million capita since 1999, compared with other leading OECD countries. Without an adequate number of qualified technical and professional human resources, Canada's ability to create, diffuse, and transform knowledge into health innovations is compromised.
- ♦ **Lack of the venture capital investments** needed to turn R&D ideas into successful business initiatives.¹⁸ Canada has failed to develop a dynamic network of venture capital investors, mainly due to high tax rates on R&D products. This shortage of both expertise and capital for new start-up ventures is limiting Canada's ability to fund innovative companies in their early stages.
- ♦ **Commercialization barriers**, such as less effective treatment of intellectual property; lack of capacity within universities and research hospitals for commercializing research; and too much emphasis on areas of research with less commercial potential.¹⁹ These barriers make it difficult to transfer knowledge from university and hospital researchers to industry. A measure of how well a country is able to transform knowledge into usable inventions (commercialization) is its number of triadic patents (patents filed simultaneously at the European

Patent Office, the Japanese Patent Office, and the United States Patent and Trademark Office). Despite healthy public R&D investments, which have strengthened the role of Canadian universities, Canada's universities file fewer triadic patents than their U.S. and European counterparts.²⁰

Two of the key weaknesses that hamper Canada's capacity to support innovation are shortages of skilled workers and lack of venture capital investments.

- ♦ **Non-innovative businesses** that drag down our capacity for innovation by focusing their resources on primary activities instead of knowledge-based or value-added activities. In 2000, The Business Council on National Issues pointed out that Canada lagged behind the Americans in business investment in new machinery and equipment—major drivers of productivity.²¹ The Science, Technology and Innovation Council's *State of the Nation 2008* report identified Canada's low business R&D and commercialization over the last 40 years.²² Between 2001 and 2007, business R&D (as a percentage of GDP) fell 20 per cent, mainly due to the technology boom collapse. As well, Canada was unable to develop its numerous, innovative Canadian-based multinationals. And it did not invest substantially at the leading edge of technology, such as in machinery, equipment, and ICTs (the average ICT investment per Canadian worker is 60 per cent of the U.S. average).²³ The same report also found that business strategy drives innovative behaviour and that few businesses in Canada choose strategies that emphasize innovation to improve productivity.

17 The Conference Board of Canada, *Exploring Technological Innovation in Health Systems* (Ottawa: The Conference Board of Canada, 2007); and The Public Policy Forum, *Innovation Nation: Building a Culture and Practice of Innovation in Canada* [online]. (July 30, 2009), [cited November 2009]. <http://uturn.cyansolutions.com/ppf/science-day-2009>.

18 The Business Council on National Issues, *Risk and Reward: Creating a Canadian Culture of Innovation* [online]. (April 2000), [cited August 2009]. www.ceocouncil.ca/publications/pdf/36a943f158903aead7c70c3c1563f640/presentations_2000_05_30.pdf.

19 Ibid.

20 The Conference Board of Canada, *Exploring Technological Innovation in Health Systems*.

21 The Business Council on National Issues, *Risk and Reward*.

22 Science, Technology and Innovation Council, *State of the Nation 2008: Canada's Science, Technology and Innovation System* [online]. (2009), [cited August 2009]. www.stic-csti.ca/eic/site/stic-csti.nsf/eng/h_00011.html.

23 Council of Canadian Academies, *Report of the Expert Panel on Business Innovation in Canada: Innovation and Business Strategy—Why Canada Falls Short* [online]. (June 2009), [cited August 2009]. www.scienceadvice.ca/innovation.html.

ENHANCING OUR CAPACITY FOR INNOVATION

Many of the reports and studies surveyed made specific recommendations about how to enhance Canada's competitive stance in innovation. The common themes that emerged are:

- ◆ **A vision and strategy for innovation**—a business strategy that promotes innovation and focuses on Canada's emerging strengths in the global marketplace, such as in advanced health technologies, pharmaceuticals, and ICTs.
- ◆ **Resource commitment**—more investment of private and public sectors in R&D, advanced machinery and equipment, and ICTs.
- ◆ **Efficient resource-market management**—regulation and tax system changes which can act as the impetus, especially in areas such as venture capital, patent protection, and income tax. Suggested actions included increasing exposure to competition, re-establishing duration of patents, adopting a more efficient approval process for prescription drugs and medical devices, and addressing regulations that restrict market access of innovative products.
- ◆ **Talent management**—attracting, retaining, and growing a knowledge-based, high-performing workforce that embraces innovation, especially in education and research institutions, but in business as well. Suggested actions include reducing the underemployment of recent immigrants, reviewing employment insurance policies, and reducing interprovincial barriers to labour mobility.
- ◆ **Knowledge translation and exchange**—institutions of higher learning are breeding grounds for innovation and there is a need to transform these discoveries into commercial successes. Collaboration and communication are keys to success through strategies such as public-private partnerships and other multi-disciplinary initiatives.
- ◆ **Monitoring progress**—through tools such as surveys that track indicators for innovation and show successes or areas where improvement is needed.
- ◆ **Sector-oriented strategy**—focusing on what we do best. Investment in sector-specific areas that allow Canada to excel globally, rather than on all sectors of the economy. Investment in Canada's key specialized areas will promote and develop strengths of the nation's innovation system.

- ◆ **Effective use of technologies**—quickly adapting new technologies to the market. Creating useful applications of the developed technologies and exploring all of their possible uses through better implementation strategies.

At times, the majority of these themes have been the focus of federal and provincial interest over the past decade. For example, the federal and some provincial governments have identified advances in health technologies and ICTs in policy documents and strategies for innovation; resources have been committed federally and provincially to advance electronic health records; initiatives have been in place in various jurisdictions to support availability of venture capital funds targeting promising areas; and knowledge translation and exchange programs have been established at federal and provincial entities to advance collaboration and partnerships. However, this siloed approach has had limited success to date.

Regulation and tax system changes in areas such as venture capital, patent protection, and income tax can enhance Canada's competitive stance in innovation.

THE MISSING INGREDIENT: INTEGRATION AND ALIGNMENT

What is required to overhaul health innovation and improve the health-care system in Canada? The answer may lie in the appropriate integration of all the major components in the health innovation ecosystem to ensure alignment of goals. According to *State of the Nation 2008*, innovation is a complex process that requires strong collaboration (both nationally and internationally) between:

- ◆ institutions of education and research that have strong, knowledgeable, and creative talent pools;²⁴ and
- ◆ a private sector that has science, technology, and innovation strategies at its core.

²⁴ Science, Technology and Innovation Council, *State of the Nation*.

There are two other fundamental participants in the health innovation ecosystem:

- ◆ health-care organizations and professionals who interface daily with patients, clients, and communities and are major users of health and health-care innovations; and
- ◆ governments, which design, implement, and enforce policies, standards, regulations, and incentives that can work in favour of or against innovation.

Canada is missing a framework to facilitate the integration of resources, priorities, strategies, and actions and to support collaboration across the various areas of interest and expertise. The “health enterprise” proposes an expanded view of the health and health-care system that would help Canada optimize resources, improve health and innovation outcomes, and increase its competitiveness.

THE HEALTH ENTERPRISE APPROACH

The proposed health enterprise, which was developed with input from the members of the Centre for the Advancement of Health Innovations, comprises four key players that need to work in synchronicity:

- ◆ health education and research institutions (universities and research hospitals);
- ◆ health and life sciences industries (including pharmaceuticals, biotech, medical devices, and medical informatics);
- ◆ health and health-care organizations and professionals; and
- ◆ governments.

Each of these players has a major role in Canada’s health innovation systems. In addition to training the talent employed by the health and health-care sectors and the health and life sciences industries, **health education and research institutions** also engage in research activities that advance the understanding of human physiology, and health discoveries that will lead to new ways to treat disease and manage health care. While academic research is frequently the source of insights that point toward new treatments, it is industry that develops and distributes the products that ultimately deliver health benefits to Canadians. **Health and life**

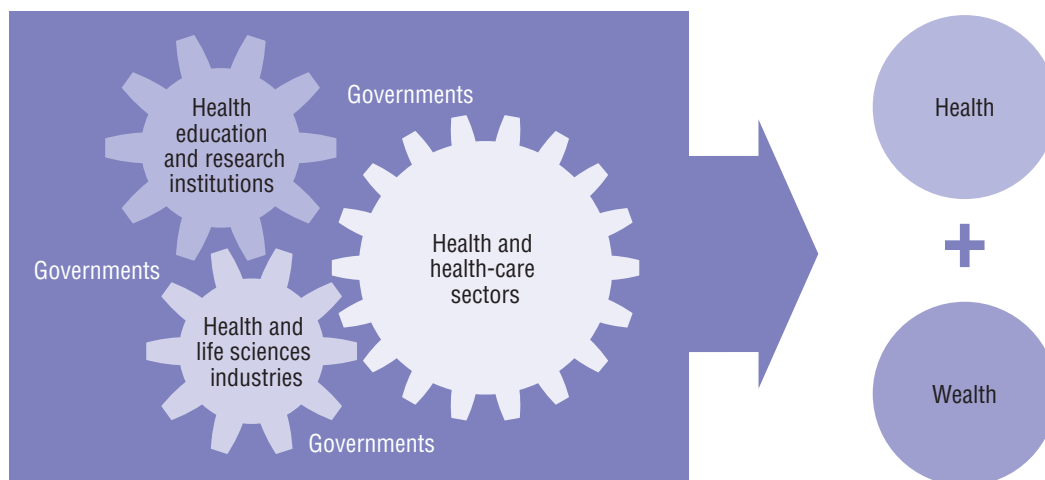
sciences industries transform discoveries into new or significantly improved products and services that have the potential to optimize health outcomes and bring economic gains. Through the adoption of these new or significantly improved products and services, **health and health-care organizations and professionals** contribute to the realization of value offered by the innovations. In addition, health-care organizations and professionals are a vast source of ideas for innovations (either technical or social) that bring tremendous benefits not only to their organizations and peers, but most importantly to patients, clients, families, and communities. Finally, through appropriate incentives, funding, policies, standards, and regulations, **governments** have the capacity to guide the focus and set the pace of this complex machinery, either by speeding it up or by stalling its outputs. (See Exhibit 2.)

Health research occurs primarily in universities and teaching hospitals. These institutions not only perform the majority of health research activities, but also fund a big proportion of them (approximately \$1.7 billion).²⁵ However, other components of the health enterprise also fund health research in Canada—exceeding \$6 billion annually. The federal government, through its many research granting agencies (e.g., the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation, and Genome Canada), provides about \$1.2 billion, while provincial governments invest approximately \$342 million. Other funding is provided by business enterprises (domestic and foreign) to the tune of \$2.4 billion, and the remainder by non-profit organizations.²⁶ Health research is very important in Canada and accounts for about one-fifth of total research expenditures. The contribution of health and life sciences industries to overall R&D in Canada is very significant; these industries are second only to ICTs in research intensity.

25 Statistics Canada, *Science Statistics: Estimates of Total Spending on Research and Development in the Health Field in Canada, 1997 to 2008* [online]. (March 2009 edition), [cited September 2009]. http://dsp-psd.pwgsc.gc.ca/collection_2009/statcan/88-001-X/88-001-x2009002-eng.pdf.

26 Ibid.

Exhibit 2
The Health Enterprise



Source: The Conference Board of Canada.

The development of health innovations is a lengthy process, particularly in the area of pharmaceutical products. Developing a safe and effective drug—from the discovery of an interesting chemical or biological action—consumes hundreds of millions of dollars and may take many years, during which close collaboration among all the players of the health enterprise is needed. The role played by industry is critical in deciding which discoveries to develop, as it is more difficult for governments and academia to pick winners. Successful commercialization of these products and services is facilitated by efficient regulatory review and a receptive market environment. But once disseminated, these innovations are critical to the continued advancement of the abilities of the health-care system to deliver improved health outcomes. In order for these products to be called true innovations, they must deliver measurable health-care and/or economic benefits to merit expenditure of public funds on their purchase.

The health enterprise represents a large part of the Canadian economy and society:

- ◆ In addition to the \$6 billion spent on health research, Canadian governments and citizens spend about

\$183 billion on health care.²⁷ Hundreds of health and life sciences organizations generate about \$22 billion in revenues,²⁸ which invigorate our economy.

- ◆ Thousands of qualified individuals are employed within the health enterprise: over 1 million people work in health occupations across the health and health-care sectors;²⁹ the life sciences industry employs about 68,000 Canadians, many of whom are highly qualified individuals in well-paid positions; and hundreds of thousands are employed in health research activities at academic institutions and health-related government departments.

27 Canadian Institute for Health Information, *National Health Expenditure Trends, 1975 to 2009* (Ottawa: Canadian Institute for Health Information, 2009).

28 Canadian Institutes of Health Research, *Health Research: Investing in Canada's Future 2004–2005* [online]. (2006), [cited September 2009]. www.cihr.ca/e/28895.html.

29 Canadian Institute for Health Information, *National Human Resources in Canada: An Overview* [online]. (2007), [cited September 2009]. http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=hhrdata_e.

In terms of overall employment, the health enterprise is equivalent to the manufacturing sector in Canada (second largest after retail trade). This makes the health enterprise very important for the economy and critical to the well-being of all Canadians.

HEALTH INNOVATION FRAMEWORK FOR ACTION

Crisis has been a major engine of transformation throughout history and it would be unfortunate to waste the opportunity presented by this economic crisis, which will likely prompt a health-care crisis. So far, we have been unable to coordinate the resources and knowledge of the four health enterprise players to drive improved health outcomes and innovation. How can this be achieved? We need to start thinking like innovators: identify problems, frame the right questions, try potential solutions, assess, and adapt. We need new approaches that will better leverage our precious resources, and allow us to be more agile and remain focused on long-term progress. But where to start? A health innovation framework for action can facilitate the identification of innovation strategies and policies that are worthy of focus.

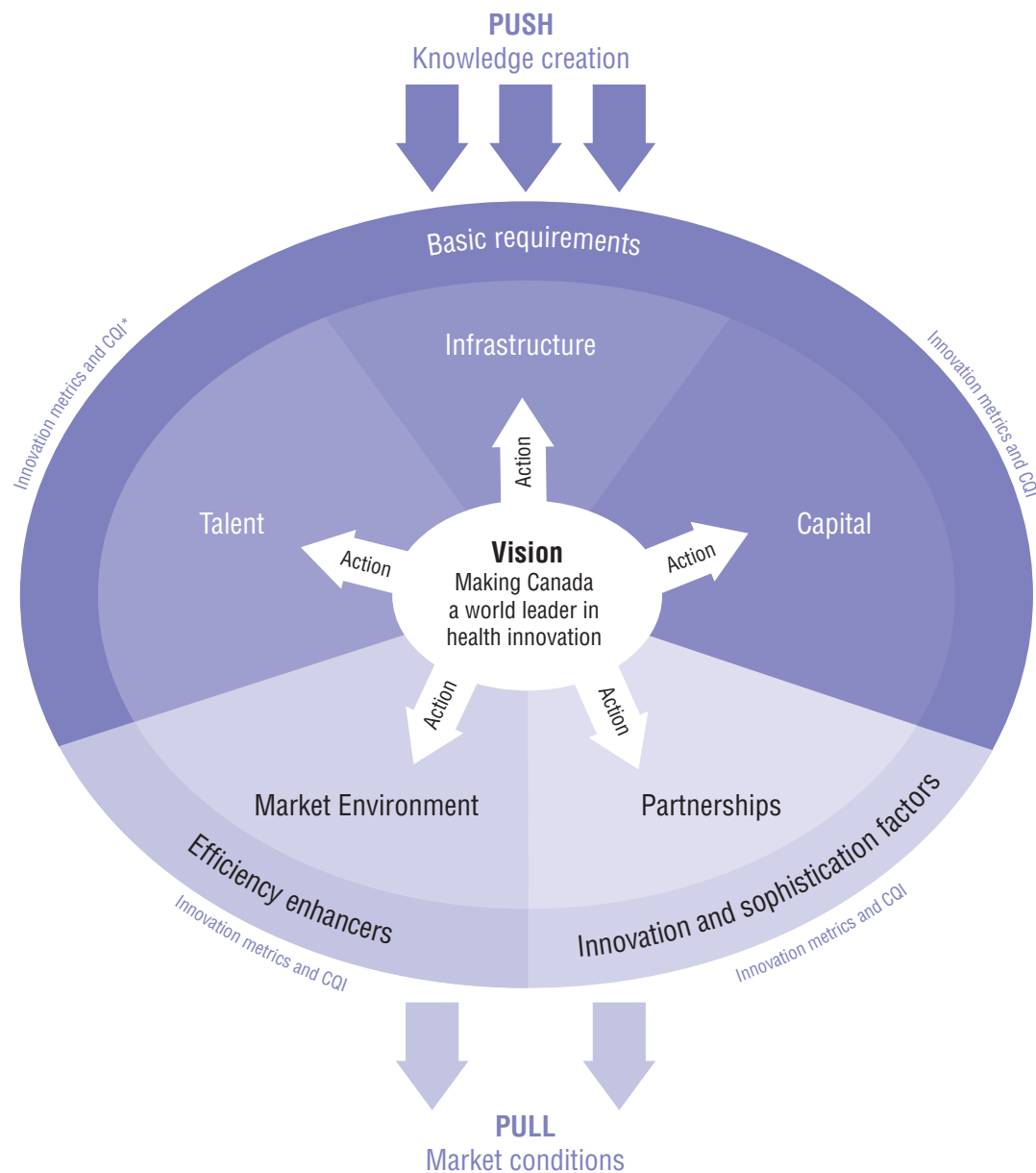
Crisis has been a major engine of transformation throughout history, and it would be unfortunate to waste the opportunity presented by this economic crisis.

The framework presented in Exhibit 3 captures the main areas on which to focus transformative actions. The areas in this framework were identified after careful analysis of the current federal science and technology strategy in this country, as well as new areas of policy focus in Europe and the United States. The framework was further refined through input from the members of the Centre for the Advancement of Health Innovations. In addition, the framework illustrates that knowledge creation and market conditions are fundamental to any high-performing health innovation system. Therefore, policies and approaches in both elements have to be reviewed and designed to optimize the push–pull effect they have on innovation. Five areas—infrastructure,

capital, partnerships, market environment, and talent—were identified. The interaction of these five areas across the health enterprise controls innovation performance in Canada’s health and health-care systems. The five are:

- ◆ **Infrastructure:** Encourages the examination of policies that can positively impact the basic physical and organizational structures required for the operation of the health enterprise. These include existing research networks that drive development of new technologies and industries; clusters and regions that capture synergies that enable greater innovative capacity and increase productivity; and science, technology, and business programs that encourage collaboration and excellence. All these elements enhance the capacity of the system for foresight, intentionality, and coordinated action.
- ◆ **Talent:** Includes policies that affect the effective and optimal utilization of the labour force of scientists, doctors, nurses, administrators, entrepreneurs, and others (including new Canadians with health-care credentials from other countries) who engage in the research, development, commercialization, and use of health innovations. This area includes policies related to labour mobility, foreign credential recognition, and leadership development. It also includes strategies that ensure competitive (according to international standards) numbers of science and technology graduates, and development and assimilation of cultural values and principles that encourage entrepreneurship, excellence, and competitiveness.
- ◆ **Capital:** Involves policies and strategies that enhance the availability of public and private funds to finance this complex ecosystem—including public and private R&D investments; venture capital investments; financing of administrative and operating systems; financing of capital infrastructure and indirect R&D costs; angel investments; and philanthropic donations.
- ◆ **Partnerships:** Relates to policies and strategies that stimulate and sustain collaboration and knowledge transfer between the human organizations and networks, which are essential to researching, developing, commercializing, training, administering, and applying health innovations. This also includes networks of patients who should be involved in evaluating the system’s performance, its needs, and the innovations required.

Exhibit 3
The Health Innovation Framework for Action



*CQI is continuous quality improvement.
Source: The Conference Board of Canada.

♦ **Market Environment:** Refers to all the forces outside of the health-care, academic, and industry sectors that affect the ability of the health enterprise to create, diffuse, and transform knowledge into health innovations, or affect the ability of Canadians to access in a timely manner the health innovations

created by the health enterprise. These include the regulations, standards, legislations, processes, and policies that enhance (or diminish) the efficiency of the system (e.g., health technologies regulatory systems, fiscal policies, intellectual property protection, and procurement processes). The forces also

include the ability to effectively engage Canadians, whose changing health and health-care needs must be the basis for the design of the health enterprise and the selection of its main goals.

Immediate action is required in each of these five areas if Canada is to improve the performance and productivity of health-care services and sustain the level of services and standard of living that many other countries have admired. Otherwise, given current financial constraints, demographic trends, patterns of health behaviours, and new disease threats, provincial health systems might not be able to sustain the level of services their citizens expect. But even before action is implemented, it is critical to identify appropriate metrics in each one of the areas to support the measurement of the effectiveness of policies implemented. This will support continuous quality improvement efforts and optimization of resources and outcomes.

This framework has been embraced by the Centre for the Advancement of Health Innovations (CAHI), a joint venture between The Conference Board of Canada and the Canadian Health Industries Partnership. CAHI is teaming up with industry, government, academia, and health-care leaders to foster a national innovation mindset to inform governments and other key stakeholders in their innovation efforts and support change.

CONCLUSION

“Tipping point” is a term describing the moment when trends converge to become unstoppable, and system failure becomes inevitable. Past the tipping point, conditions steadily worsen, no matter what resources are thrown at the problem. The system effectively collapses “entropically,” as energy drains away to the point where basic order can no longer be maintained. Are we there yet? The current trends and numbers suggest that Canada’s health and health-care systems may be very close. At the same time, it is difficult to imagine that if these systems “tipped,” the impact could be contained, any more than could the tipping of the financial system be contained from the broader economy.

The current economic crisis provides an opportune window for taking advantage of the financial pressures to reshape current health, health-care, and innovation systems. The crisis also provides an opportunity to consider systemic governance and structural models that will ensure the strategic alignment of key priorities and policies, and generate significant cost savings. European countries have embarked on rounds of consultations that show how policy coordination and innovation can generate benefits for patients, while reducing coordination costs within the health-care system as a whole. The U.S. has aggressively engaged in a plan for long-term economic growth that includes bold investments in health research and innovation, and encourages steps toward a national health-care plan.

The time is right to focus on the creation of a comprehensive, national health-innovation policy for Canada—one that can successfully address its health and innovation goals. There is enough power (in terms of labour and investments) within the health enterprise to find appropriate solutions to Canada’s health and health-care challenges. Studies done in the U.S. and the U.K. have demonstrated the value of health research and the resulting innovations. Furthermore, opportunities exist to align incentives within the components of the health enterprise to drive population health improvements. For example, some pharmaceutical companies and insurers in the U.S. have started linking outcomes to incentives through contractual agreements.³⁰ The impact of the health enterprise could even be expanded if this enterprise operates in alignment with communities, employers, non-governmental organizations, and other key sectors to support the successful translation of innovations into practical use. The size of the health enterprise can also help to refocus Canada’s economy on knowledge-based (as opposed to resource-based) industries, which will support the attainment of Canada’s innovation and competitiveness goals. Designing these policies demands a high degree of leadership, determination, organizational focus, and collaboration. But the benefits are too numerous to ignore. Let’s not waste a crisis that could move this agenda forward.

30 Cyndy Nayer et al., *Leveraging Health* (St. Louis, MO: Centre for Health Value Innovation, 2009).

APPENDIX A

Canadian Innovation Reports Reviewed

B.C. BIOTECH. *Building World-Class Biotech Businesses in British Columbia: The Industry Position*. www.lifesciencesbc.ca/files/PDF/BCBIO_postionpaper.pdf.

Council of Canadian Academies: Committee on the State of Science and Technology in Canada. *The State of Science and Technology in Canada* (September 2006). www.scienceadvice.ca/study.html.

Council of Canadian Academies: Report of the Expert Panel on Business Innovation in Canada. *Innovation and Business Strategy: Why Canada Falls Short* (June 2009). www.scienceadvice.ca/innovation.html.

Industry Canada. *Mobilizing Science and Technology to Canada's Advantage* (2007). [www.ic.gc.ca/eic/site/ic1.nsf/vwapj/S&Tstrategy.pdf/\\$file/S&Tstrategy.pdf](http://www.ic.gc.ca/eic/site/ic1.nsf/vwapj/S&Tstrategy.pdf/$file/S&Tstrategy.pdf).

Ministry of Health, British Columbia. *Report of the Pharmaceutical Task Force* (April 2008). www.health.gov.bc.ca/library/publications/year/2008/PharmaceuticalTaskForceReport.pdf.

Ontario Ministry of Research and Innovation. *Seizing Global Opportunities: Ontario's Innovation Agenda* (2007). www.mri.gov.on.ca/english/programs/oia/documents/Ontario%20Innovation%20Agenda.pdf.

Public Policy Forum. *Innovation Nation: Building a Culture and Practice of Innovation in Canada* (May 2009). www.ppforum.com/sites/default/files/Final_Report_Science_Day.pdf.

Science, Technology and Innovation Council. *State of the Nation 2008: Canada's Science, Technology and Innovation System* (2009). www.stic-csti.ca/eic/site/stic-csti.nsf/eng/h_00011.html.

Sharp, Andrew. *Lessons for Canada From International Productivity Experience* (October 2006). www.csls.ca/reports/csls2006-02.pdf

The Business Council on National Issues. *Risk and Reward: Creating a Canadian Culture of Innovation* (April 2000). www.ceocouncil.ca/publications/pdf/36a943f158903aead7c70c3c1563f640/presentations_2000_05_30.pdf.

The Conference Board of Canada. *How Canada Performs: A Report Card on Canada 2007* (June 2007). <http://sso.conferenceboard.ca/e-Library/LayoutRecentPublications.asp>.

The Metropolitan Montréal Life Sciences Committee. *Acting Now To Realize the Full Potential of the Life Sciences: A Foundation for the Prosperity of Metropolitan Montréal, Quebec and Canada* (July 2004).

Acknowledgements

CENTRE FOR THE ADVANCEMENT OF HEALTH INNOVATIONS (CAHI) MEMBERS

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ABOUT THE CENTRE FOR THE ADVANCEMENT OF HEALTH INNOVATIONS (CAHI)

The Centre for the Advancement of Health Innovations (CAHI) is a joint initiative of The Conference Board of Canada (CBoC) and the Canadian Health Industries Partnership (CHIP). Its mission is to make Canada a world leader in the development and commercialization of health innovations. The Centre brings together senior executives from industry, governments, health care, education, research, and not-for-profit organizations to explore opportunities to strengthen the health innovation environment, improve Canada's health-care system, and bolster the capacity to commercialize Canada's health innovations.

The Centre's activities and research agenda are managed by CBoC, under the guidance of Dr. Gabriela Prada, Director, Health Innovation, Policy and Evaluation, with leadership provided by CAHI co-chairs Mark Lievonen, President of Sanofi Pasteur Limited, and George Ross, Deputy Minister, Ontario Ministry of Research and Innovation.

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¹ Neither the members nor their employers necessarily endorse the research conclusions of this briefing.

The Health Enterprise: Charting a Path for Health Innovation

by *Gabriela Prada*

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