

SHIFTING PERCEPTIONS: HEALTH INDUSTRIES AS A SOURCE OF WEALTH CREATION IN BRITISH COLUMBIA

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TABLE OF CONTENTS

INTRODUCTION	1
MAPPING THE BC HEALTH INNOVATION CLUSTER	6
<i>Research Activity in BC</i>	11
<i>Health Exports</i>	16
CHALLENGES FOR THE HEALTH INDUSTRIES CLUSTER	17
LEVERAGING STRENGTHS: RECOMMENDATIONS TO SPUR THE DEVELOPMENT OF THE HEALTH INNOVATION CLUSTER	25
<i>Translational Research: BC Cancer Agency (BCCA)</i>	25
<i>BC Linked Database and PharmaNet: New Directed Opportunities</i>	27
<i>Overcoming Marketplace Inhibitors to Health Innovation</i>	28
<i>Health System Cost Savings Through Innovative Collaboration</i>	30
<i>Identifying and Tracking the Sector</i>	32
<i>Addressing Market Access</i>	33
<i>Further Recommendations</i>	34
CONCLUSION	35

**SHIFTING PERCEPTIONS:
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“It is to see Canada’s publicly funded health system not as a cost to be endured, but as an opportunity to be explored. To align more effectively our social and economic policy directions; to put in place the right incentives; to reward entrepreneurship/innovation; to ensure that investment and regulatory regimes facilitate access to capital and markets; and to celebrate success.”¹

INTRODUCTION

If ever there was a market that would appear to present an alluring commercial opportunity thanks to its size and growth prospects, it is the health care sector. In Canada, overall health care spending reached \$183.1 billion in 2009, up \$9.5 billion from 2008.² Among the OECD countries collectively, total expenditures on health care stand at close to US\$3 trillion.³ Looking ahead, the potential growth in demand for health-related products and services would seem to be almost limitless. As populations age in North America, Europe, Japan, Russia, China and other parts of the developing world, outlays on modern diagnostics and treatments are certain to escalate. In advanced countries the proportion of the population over age 60 is set to rise from between 15% and 20% today to more than 30% by 2050.

The market for new pharmaceuticals, biopharmaceuticals and medical devices geared to treating ailments common in older populations will be especially robust. Data from the United States indicates that per capita health spending for those under 65 years of age is roughly US\$2,800 per year, compared to US\$8,200 for the 65 to 74 age cohort, US\$12,200 for those aged 75 to 84, and US\$20,000 for people fortunate enough to live beyond age 85.⁴

¹ Dr. Henry Friesen, “Health care can be an engine of economic growth,” in Public Policy Forum, [Newsletter](#) (Summer 2003), p. 7

² Canadian Institute for Health Information, [National Health Expenditure Trends 1975-2009](#) (November 2009).

³ PriceWaterhouseCoopers, Health Research Institute, [HealthCast 2020: Creating a Sustainable Future](#) (2006).

⁴ Centres for Medicare and Medicaid Services, Office of the Actuary, National Health Statistics Group.

As less developed nations become wealthier and undergo their own version of population aging, they can be expected to follow the path of advanced countries and devote a greater share of their national economic resources to health care.

The real impact of population aging on the cost of health care lies in the future. A study by the OECD finds that over the past 20 years, aging played a fairly minor role in higher health spending, both in absolute terms and relative to GDP. Looking just at public sector spending, the OECD reports that between 1981 and 2002, per capita health outlays in the developed world grew on average by 3.6% per year.⁵ Decomposing the main drivers of this increase, the costs associated with aging pushed spending up by 0.3% annually, whereas rising levels of wealth were responsible for 2.3% of the annual increase. The remaining 1% of the growth in per capita health spending was attributable to technological progress and changing prices. In the future, greater wealth and advances in technology will both continue to affect health spending, but population aging will be the dominant factor propelling spending higher. The OECD concludes that under a “cost-pressure” scenario, where advances in technology continue to drive up costs, real per capita health expenditures across the OECD could grow by 4% annually through 2050. On the other hand, if countries are able to contain non-demographic health care costs, per capita spending could rise at a more modest annual rate of 2%.

In sum, a combination of more sophisticated medical treatments, technological progress, and aging populations is set to produce a sustained rise in health care outlays. In aggregate terms, PricewaterhouseCoopers estimates that health spending in the OECD countries could reach US\$10 trillion by 2020.⁶

⁵ OECD, Projecting OECD Health and Long-term Care Expenditures (2006).

⁶ PriceWaterhouseCoopers, Health Research Institute (2006).

Country / Region	Share of Total Population Over Age 60 (%)		Share of Total Population Over Age 80 (%)	
	2009	2050	2009	2050
Europe	22	34	4	10
North America	18	28	4	8
Asia	10	24	1	4
Japan	30	44	6	16
Republic of Korea	15	41	2	13
Germany	26	40	5	14
Italy	26	39	6	13
Singapore	15	38	2	15
Greece	24	38	4	11
Portugal	23	38	4	11
Austria	23	36	5	12
France	23	33	5	11
Canada	20	32	4	10
Belgium	23	32	5	11
Switzerland	23	32	5	11
China	12	31	1	7
Netherlands	21	31	4	10
Australia	20	30	4	9
Ireland	16	30	3	7
Norway	21	30	5	9
Sweden	25	30	5	9
New Zealand	18	29	3	9
Denmark	23	29	4	9
United Kingdom	22	29	5	9
United States	18	27	4	8
Thailand	11	26	1	5
Indonesia	9	25	1	4
Turkey	9	24	1	4
India	7	20	1	3

Source: "World Population Prospects," United Nations, Department of Economic and Social Affairs, Population Division (2008)

Against this backdrop, research and development and the production of inputs used in the provision of health care are becoming important sources of economic activity in many nations. For countries positioned to compete in the expanding global marketplace for health-related goods and services, industries linked to the health care sector will make significant contributions to jobs, economic growth and wealth creation. Arguably, the presence of an advanced health industries cluster is fast becoming one of the things that defines a leading-edge economy.

The Canadian and provincial governments have made very large commitments to health research. The federal government, for example, established the Canadian Institutes of Health Research (CIHR) in 2000 to build research capacity, fund research in targeted priority areas, and train health researchers. In 2007/08 the organization provided \$90 million in funding for health research in British Columbia. Since its inception, the organization has awarded \$535 million to research institutions in BC.⁷ The majority of federal funding for health research is channelled through CIHR (about 60% in recent years), but additional funds are also provided through Canada Foundation for Innovation, Genome Canada, National Health Research Council, Health Canada and a number of other agencies and foundations.

However, Canada is lagging when it comes to providing assistance to small and medium sized businesses as they attempt to commercialize R&D. To date, British Columbia and Canada as a whole have failed to capitalize on the broader economic development and industrial diversification potential of the health care sector. Despite spending billions to deliver services and sourcing many health-related inputs domestically, Canada has had limited success in growing successful health care businesses, and less still in exporting health-related products and services.⁸ With relatively few large globally competitive companies active in the sector, the value of Canadian health-related exports stood at just \$6.5 billion in 2006, equivalent to a miniscule 1.4% of all merchandise exports. In comparison, health care-related products make up more than 5% of America's merchandise exports.⁹

In British Columbia, the contribution of health exports is even smaller. The \$212 million in foreign sales by what this paper classifies as the *health innovation cluster* added up to just 0.6%

⁷ Canadian Institutes of Health Research, www.cihr-irsc.gc.ca.

⁸ Roger Martin, "Where are the Exports? The Canadian Health Care Mystery," Joseph Rotman School of Management, University of Toronto (November 4, 2003).

⁹ TradeStats Express, Office of Trade and Industry Information, US Department of Commerce (share is based on a comparable list of HS export classification codes).

of the province's merchandise exports in 2006.¹⁰ And it must be noted that this low share is not because BC is an export powerhouse in other areas. In fact, the province suffers from a comparatively weak export base: BC's total exports (international and interprovincial, and covering goods plus services) amount to around 45% of GDP, the lowest share among all ten provinces. Indeed, British Columbia's poorly diversified export base is one of the reasons why policy makers and business leaders should be looking to develop a more vibrant health innovation cluster.

The main goal of this paper is to highlight the economic potential of BC's health-related industries. In support of this theme, a number of topics are explored. The first is the size and scope of the "health innovation cluster." It turns out to be surprisingly difficult to quantify, as the cluster is not readily identifiable in official statistics. But the information that is available indicates that BC has a sizable, if underdeveloped, health innovation cluster, made up of organizations engaged in developing and selling products and services domestically and internationally, together with a host of institutions involved in health-related research. British Columbia has competitive strengths in several areas, which provide a solid foundation for nurturing the growth of health innovation industries. A more detailed review of the health sector's export performance confirms that there is substantial room for expansion.

A second focus of this paper is to unearth the reasons why BC has such a small export presence in markets for health goods and services. Here, the market structure and behavioural characteristics of a mainly publicly-funded, single payer health system figure prominently. Even though the province spends more than 40% of its annual budget on health services, linkages with and support for local companies supplying inputs to the system are poorly developed. In part this can be traced to an overarching preoccupation with cost containment that shapes all dimensions of health care policy and management in Canada.

¹⁰ Statistics Canada, Merchandise Trade Database and Provincial Economic Accounts. Health exports include antibiotics, pharmaceutical products, x-ray film, laboratory and pharmaceutical equipment, sterilizers, wheel chairs, surgical equipment, mechanical and other breathing appliances, orthopaedic and other appliances worn or implanted, and other imaging devices. Services are not included.

As a result, the delivery of health services operates in isolation from the indigenous, commercially-oriented health industries cluster, which blunts opportunities for local companies to introduce new and innovative products and ideas.

The final section of the paper outlines recommendations and policies to foster a dynamic health innovation cluster in British Columbia. A forward-looking strategy needs to recognize the economic and industrial potential of health care and not consider health-related products and services exclusively through a cost lens. This means leveraging the advantages of the publicly-funded system by strategically using health care data, finding ways to speed up the introduction of innovative products and technologies, and continuing to support BC's network of health-related research institutions. It is important to note that the discussion that follows is not directed at changing in any fundamental way the current publicly-funded health care model. Instead, the objective is to urge policy-makers to think about the products and services used by the health system in a different way: as inputs to the system which have commercial potential beyond BC's borders. Most of the recommendations in this paper are aimed at making better use of particular attributes of the existing health care system.

MAPPING THE BC HEALTH INNOVATION CLUSTER

As an initial step, it is necessary to distinguish between the delivery of health services and what we call the "health innovation cluster." The former refers to the health services provided to local residents, largely through the public system, which relies for the most part on government financing. The latter encompasses the many goods and services produced by private industry which are inputs into the provision of health services, and/or that can be exported to other markets.

The health innovation cluster is defined here to include all industry segments that produce goods used in the delivery of health care (everything from machinery to medicines to bandages), certain high-value services provided to the domestic health care system (imaging, data management and so on), plus research activity undertaken in BC that leads to the discovery and development of new health-related products and technologies. This definition

points to a diverse and interrelated cluster that includes biotechnology and pharmaceutical firms, companies involved in developing and manufacturing medical devices and other equipment, health information and bioinformatics, and other knowledge-based services that support health care. Similar definitions are used in other jurisdictions and studies when analyzing health innovation clusters. A common thread that ties together the various parts of the cluster is that the products and services can be used locally but are also exportable. The numerous university and public research agencies in British Columbia which are engaged in health and life sciences research are also an important component of the cluster. Although this research takes place within the province, from an economic perspective much of the activity can be treated as an “export” because funding for the research, clinical trials, and other related work frequently flows into British Columbia from external sources.

Together, the various parts of the health innovation cluster make a modest but still appreciable contribution to the provincial economy. Information collected at the start of the decade suggested there were at least 500 companies operating in BC’s health innovation cluster, employing some 10,000 people (see table below).¹¹ With subsequent growth and the inclusion of additional research activities as part of the cluster, we estimate that employment in the health innovation cluster now stands closer to 15,000. This represents 0.6% of the province’s workforce and compares favourably with many other export-oriented industries. For example, it is more than the workforce in BC’s mining industry and roughly equal to the number people directly employed on a full-time basis in the motion picture and sound recording industry.

The delivery of health care services with which most people are familiar is a vastly larger and far more labour-intensive enterprise. It includes nurses, physicians, clinicians, physiotherapists, and pharmacists and so on. With more than 120,000 people working in the field, the health services sector is one of the biggest employers in the province. In fiscal

¹¹ Note most of the employment figures are based on data collected several years ago so today’s total is probably higher, although the sector’s share of total BC employment is likely similar.

year 2008-09 the BC government spent more than \$14 billion on health care.¹² While an effective health care system is a vital part of ensuring a high quality of life for BC residents, health delivery is supported predominantly by government funding and tax dollars. In this respect it differs from the commercial or local supply sector, which is an economic driver and a source of wealth creation. That said, the amount and concentration of health spending and expertise in BC creates opportunities to develop synergies between the mainstream health sector and the health innovation cluster. Almost three-fifths of the revenues of BC's health innovation industries come from selling products and services within the domestic health care system.¹³

It is worth asking why the health innovation cluster is hard to measure, and why the employment and company counts reported above must be treated as only rough estimates. For one thing, the health innovation cluster is not identified as an industry or group of industries in the official statistics which track metrics such as revenues, employment and gross domestic product (GDP). Rather, its different elements are scattered across a number of distinct industries and sub-industries. Because most parts of the health innovation cluster are actually embedded within broader industrial categories that often include activities unrelated to health, it is not possible to add the various industries together to arrive at an estimate of the total size of the cluster. For example, most of bio-technology is included in an official industry called "Research and Development in the Physical, Engineering and Life Sciences." Without more information, it is impossible to know what fraction of this industrial category is specific to Life Sciences. Another example is "Navigational, Measuring, Medical and Control Instruments Manufacturing," of which an unknown portion is considered part of the medical devices category. The "Pharmaceutical and Medicine Manufacturing Industry" is more clearly delineated as predominantly health-related, but this is the exception.

¹² BC September 2009 Budget Update.

¹³ Ference Weicker & Company, Analysis of the BC Health Technology Network (November 2000).

To quantify the cluster, therefore, it is necessary to draw on alternative data sources, such as private surveys. The most comprehensive examination of BC’s health innovation cluster was completed several years ago by Ference Weiker (a management consulting company). The firm undertook an independent review of the health industry to “determine the size, structure and characteristics of the health technology community in British Columbia.”¹⁴ The summary findings are reported in Table 2, supplemented with updated estimates where possible. More recent data on employment in some segments of the health innovation cluster are not available. Discussions with industry leaders and other experts suggest that total employment in the cluster was in the range of 15,000 by 2008 if one also includes health-related research that attracts outside funding support.

<i>Health Industry Segment</i>	Employment		Number of Companies	
	2000 estimate	Current estimate	2000 estimate	Current estimate
Pharmaceutical / Biotech using molecular and cellular biology and genetics in the production of medicines, vaccines, diagnostics and gene therapy; biopharmaceuticals refers to the manufacturing of pharmaceutical products, which are usually derived from a biological interaction with living organisms.	1,929	2,600 ^b	111	100 ^b
Medical Devices the production and development of any instrument or apparatus used to treat or diagnose illnesses or injuries.	2,727	na	211	na
Health~ & Bio-informatics - the study, development and implementation of structures and systems to improve communication and management of medical information. Bio-informatics is more specialized, deriving information from biological data. This can come from information stored in genetic code, but also from experimental results, patient information and even scientific literature.	2,816	na	67	na
Health Services - management consulting, human resource services, training and education, clinical trial services as they relate to the provision of health care.	2,485	na	114	na
Total Health Innovation Cluster	9,957	na	503	na
Sources: ^a Ference Weicker & Company, <i>Analysis of the BC Health Technology Industry</i> (November 2000). ^b Life Sciences BC, estimate covers just biotech companies.				

¹⁴ Ibid., p.1.

Statistics Canada's Business Patterns Database is an alternative data source that contains some relevant information. It allows for an accurate count of the number of business establishments in different industries. As with most of the industry-based data generated by Statistics Canada, the counts follow the North American Industrial Classification System (NAICS), so most of the health industry segments of interest here are combined with other, non-health-related businesses. Despite this limitation, the Business Patterns data partially corroborate the findings of the Ference Weicker analysis. They also suggest that BC's health innovation cluster is somewhat larger than portrayed in the now dated Ference Weicker study.

Table 3
BC Establishment Counts for Health-Related Industries, 2006

Industry	Number of Employees									
	Total with Employees	1-4	5-9	10-19	20-49	50-99	100-199	200-499	500+	No Employees*
Pharmaceutical and Medicine Manufacturing	43	22	5	2	6	6	2	0	0	26
Measuring, Medical and Controlling Devices Manufacturing	78	33	10	10	14	6	3	2	0	50
Medical Equipment and Supplies Manufacturing	318	193	56	31	22	11	3	2	0	119
Testing Laboratories	204	128	29	14	19	8	4	2	0	360
Other Scientific and Technical Consulting Services	732	579	97	32	21	3	0	0	0	1615
Research and Development in the Physical, Engineering and Life Sciences	319	146	41	51	38	22	14	7	0	271
All Other Professional, Scientific and Technical Services	618	395	96	65	53	6	1	2	0	1131
Medical and Diagnostic Laboratories	220	144	30	26	10	4	1	4	1	50

Source: Statistics Canada, Canadian Business Patterns Database, custom tabulation.

* Most establishments in this category do not have employees but some of them are indeterminate so they may have employees but Statistics Canada was not able to determine how many.

A comparison of the two data sources can be made in the case of one specific component of the health innovation cluster: medical devices. This is a segment where the relevant NAICS category (Medical Equipment and Supplies Manufacturing Industry) lines up quite well with the industry as defined in the Ference Weicker study. According to Statistics Canada, there are 318 establishments (with paid employees) in the medical devices industry in BC, which is significantly more than the 211 reported in the Ference Weicker study.¹⁵ This difference, however, is not a surprise. First, like most industries, the medical devices sector has grown since 2000. And second, a one-time survey is unlikely to be as comprehensive as a Statistics Canada database that is routinely maintained and updated. Smaller firms are difficult to identify and capture in a one-off survey. With 60% of medical device establishments reporting fewer than five employees, it would not have been possible for Ference Weicker to compile a complete census of the industry. Given these considerations, the Ference Weicker estimates can be treated as reasonable as of 2000 but on the conservative side from the vantage point of 2009. The above data provide a very general sense of the size and make up of the health innovation cluster in the province, but should not be considered a definitive representation of the sector.

Research Activity in BC

Research is the cornerstone of the health innovation cluster. One of BC's recognized competitive advantages is the presence of high-profile health research centres that engage in joint initiatives and collaborations involving universities, hospitals and clinicians, and private industry. These institutions help to attract and retain highly qualified personnel (HQP) and foster a positive learning environment for graduate students, post-doctoral researchers, and clinicians. They also serve to anchor and concentrate external grant funding

¹⁵ It is also possible to generate a very rough estimate of the number of employees from this data source by using the mid-point of the employment ranges for the smaller categories (e.g., 7 for the 5 to 9 range and 15 for the 10-19 category) and the low bound for the categories with over 50 employees (e.g., 50 for the 50 to 99 range) as the representative size for the establishments in each category. Multiplying the number of establishments by the appropriate mid-point and lower bound figures in the respective categories results in an estimate of 3,100 people working in the medical devices industry, which is also somewhat larger than the 2,816 Ference Weicker estimate.

for research carried out in the province. A brief overview of some of the more prominent facilities highlights the province's extensive health research base.

The Michael Smith Foundation for Health Research (MSFHR) is the provincial support agency for health research. It was established in 2001 with a 5-year grant of \$110 million to develop British Columbia as a leader in health research. In 2006 it was awarded another \$120 million. Funding is dispersed to a variety of organizations and researchers to build health research capacity in the province. Between 2001 and 2008 the organization distributed \$97 million to 283 health researchers, 74 of whom were recruited from other provinces. Another \$37 million went to support more than 1,000 research trainees associated with British Columbia's universities and teaching hospitals.¹⁶ MSFHR also committed \$32.8 million to support 31 BC-based research units and a further \$23.7 million to BC's major research institutions, helping foster a vibrant health research environment across the province. A contribution in 2003 of \$6.1 million to Genome BC, another major local research organization, triggered an equivalent amount of federal funding from Genome Canada for cancer and other genetic research at the BC Cancer Agency and UBC.

More recent additions to British Columbia's health research infrastructure include the Life Sciences Institute (LSI) and the Centre for Drug Research and Development (CDRD), both located at the University of British Columbia. The Life Sciences Institute's goals are to advance the understanding of disease processes, identify potential therapeutic targets and more generally to generate and sustain innovative interdisciplinary research related to the fundamental biological processes of life.¹⁷ With a focus on translating knowledge into improved health care and new economic ventures, it promises to play an important role in expanding BC's health innovation cluster. To date the LSI has secured more than \$195 million in funding.¹⁸

¹⁶ Michael Smith Foundation for Health Research, "Strategic Direction 2009-2015."

¹⁷ Life Sciences Institute: <http://www.lsi.ubc.ca>.

¹⁸ Multiple sources for this funding are the Province of British Columbia (\$110 million), University of British Columbia (\$54.4 million), Canada Foundation for Innovation (\$13.8 million), BC Knowledge Development Fund (\$13.8 million), Bayer Inc. (Centre for Blood Research \$1.5 million) and the Canadian Blood Services

The Centre for Drug Research and Development was created to help bridge the gap between research and commercialization. Its main goal is to advance promising medical discoveries to a commercially viable stage by creating an infrastructure that brings together researcher, institutions, government and industry. The Centre has received funding totaling \$66 million – a significant achievement.¹⁹ This support allows the CDRD to implement its novel research and development model, which provides the infrastructure and knowledge to facilitate the movement of new medical discoveries from early development to the point where they can be made available to the market for further investment and commercialization. The CDRD currently has over 270 projects in its database and has approved 18 projects for active development and is moving another 14 through the project approval process.

Genome British Columbia is another catalyst for BC's life sciences and health innovation cluster. It invests in and manages large-scale genomics and proteomics research projects. The organization collaborates with government, universities and industry. With a provincial contribution of \$102.5 million for the period 2001-2010, Genome BC is investing over \$375 million in a host of research projects and technology platforms, of which two-thirds are health-related. Like other research institutes, Genome BC has been able to attract substantial funds to the province from external sources.

In addition to these centres, BC is also home to the internationally recognized Canadian HIV Trials Network, a partnership of clinical investigators, physicians, nurses, people living with HIV/AIDS, pharmaceutical manufacturers and others.²⁰ Jointly sponsored by UBC and St. Paul's Hospital (Providence Health Care), the Network is also funded by the Canadian Institutes of Health Research (CIHR). It has made notable contributions in advancing AIDS

(Centre for Blood Research \$1.5 million) as reported on UBC Life Sciences Institute website: <http://www.lsi.ubc.ca>.

¹⁹ The province of BC provided \$25 million in funding followed by an additional \$8 million grant. The Canadian Foundation for Innovation also provided \$8 million in funding and the Michael Smith foundation recently donated \$1 million and Pfizer Canada has donated \$3 million in funding. Centre for Drug Research and Development, <http://www.cdrd.ca>.

²⁰ Canadian HIV Trials Network website <http://www.hivnet.ubc.ca>.

care; following an international peer review in 2003, CIHR increased its annual support for the Network by 30%.

Provincial government funding for the CDRD, the Michael Smith Foundation, and Genome BC, together with its support for the universities, has been invaluable in building up the health innovation cluster's research capacity and attracting external research dollars. In recent years British Columbia has seen the largest gains in sponsorship of health-related research among Canadian jurisdictions.²¹ Between 1999 and 2008 funding for BC health research jumped dramatically. For example, funding from the Canadian Institutes of Health Research (CIHR) rose from \$20 million to \$100 million annually. Private sector contributions have also increased significantly driven in large part by commitments from large pharmaceutical companies. BC's share of funding from federal sources, businesses and not-for-profits climbed \$325 million beyond its 2001 proportion over the first two-thirds of the above noted period.²²

With this solid base, a number of BC's health research institutes have been able to extend their reach through project partnerships with other world-class institutions in the US, Europe and elsewhere. Examples include partnerships with the Sanger Institute in the UK, Washington University, and the California Joint Genome Institute at Walnut Creek. Funding from the American National Institute of Health (NIH) for BC health research projects is evidence that the province's research excellence is now recognized on a global scale.

Within the health innovation cluster, biotechnology has emerged as a key growth sector. Boasting three of the first profitable biotech companies in the world and endowed with well-regarded research facilities, BC is recognized as an emerging biotech centre. This reflects not just the province's research capacity but also its track record in technology and knowledge

²¹ Michael Smith Foundation for Health Research, "Evaluating British Columbia's Performance in Health Research: Technical Report 1999-2006" (March 2007).

²² Michael Smith Foundation for Health Research, "Strategic Direction 2009-2015" (July 2009).

transfer. Many BC biotech firms are spin-off companies from UBC. And the potential for more commercial successes is significant, as UBC is ranked 9th in North America (and first in Canada) in producing high quality, patentable research. BC-based research is also noted for having a high rate of return. In the past, the province generated the best exit values per R&D dollar invested of all Canadian provinces. Moreover, the ratio of exit value per venture capital dollar invested is higher here than in many top US jurisdictions.

Government support is an important factor in the success of the health innovation cluster, with both federal and provincial governments making substantial contributions to life sciences-related research. The federal government's investments in health research have stimulated innovation by creating and sustaining a supply of professionals, research hospitals, and health research infrastructure – all of which provide vital support for research and development activities. In addition to its financial support to universities and research hospitals, the BC government deserves credit for taking steps to encourage private sector R&D in biotechnology through the province's R&D tax credit and also by providing a 75% tax refund on revenues generated from life sciences patents. British Columbia is the first jurisdiction in North America to offer the latter tax benefit. The combination of federal and provincial tax credits for R&D in British Columbia reduces a local biotech company's effective "burn rate" to \$0.32 on the dollar.

In sum, British Columbia has become a health research centre with an established reputation nationally and internationally. Several thousand people are working in health and life sciences research in the province, placing research at the centre of the local health innovation cluster. While BC has many firms engaged in manufacturing and exporting health care products, the province is unlikely to attract large-scale pharma manufacturing. Instead, BC's strength lies in research, innovation and niche product development. Going forward, among the key challenges for the sector are translating research and new discoveries into commercially viable products and technologies, and building and retaining successful companies that reinforce the capacity to attract talent and funding to the province.

Health Exports

From an economic perspective, exports are critical for a small economy like British Columbia because they provide an inflow of income or revenue from external sources. Apart from selling health goods and services, health-related research also bolsters the cluster's export footprint because a very high proportion of the funding for such research comes from outside sources. As noted above,

health-related products form only a tiny part of the province's export base, amounting to \$146 million in 2008 (down from \$212 million in 2006), which amounts to about 0.5% of total merchandise exports. But the good news is that exports in this category have grown quickly. In 1994, exports of health products were valued at \$28 million, meaning that they 425% over the past 14

years. In comparison, BC's total exports grew 40% over the same time period. Health products accounted for just 0.12% of BC's merchandise exports 1994, so their contribution to overall provincial exports has increased nearly fivefold.



Medical devices are currently the most visible export segment in the health innovation cluster, comprising more than 90% of BC's health care merchandise exports. Surgical and medical instruments account for the biggest shares of export earnings among the various health-related sub categories, followed by pharmaceutical products. In exploring ways to make the health care sector a more significant economic contributor, service exports also deserve consideration. Unfortunately, this is another area where data limitations preclude a detailed analysis. Service exports in general are not well measured, so reliable figures for exports of health services are not available. The Ference Weicker study reported that 72% of

health informatics revenue generated by BC firms came from foreign sales (mostly to the US) and another 15% from sales to the rest of Canada.²³ It also found that health informatics revenue was nearly twice that of the medical device segment. Both health informatics and medical devices derive a similar share of revenues from exports, but because the former generates nearly twice as much revenue as the latter, including the health informatics industry would substantially elevate the health sector's overall export profile.

Table 4
BC Health-Related Merchandise Exports, 2008

Product Category – Harmonized System (HS) Codes	2008 thousands \$	<u>Share of total health industry exports (%)</u>
Medical Devices and Instruments	133,712	91.4
Surgical and medical instruments and appliances (HS 9018)	76,721	52.4
Mechano-therapy apparatus, massage appliances, masks & breathing apparatus (HS 9019+HS 9020)	23,063	15.8
Orthopaedic & other appliances worn or implanted (HS 9021)	21,751	14.9
Apparatus using radiation for medical purposes (HS 9022)	4,908	3.4
Wheel chairs (HS 8713)	6,865	4.7
Other	404	0.3
Pharmaceutical and other Products	12,639	8.6
Organs, Herapin and its salts – therapeutic uses (HS 3001)	1,569	1.1
Blood & blood preparations (HS 3002)	3,136	2.1
Medicaments – not in measured doses (HS 3003)	381	0.3
Medicaments – in measured doses (HS 3004)	6,385	4.4
Other pharmaceuticals and antibiotics	1,246	0.9
Source: Industry Canada, Online Trade Database. totals may not sum due to rounding		

However, reliable data on health informatics exports are not available. We estimate that BC's health innovation cluster obtains just 6% of its revenues from international exports. There clearly is room to boost this figure in the next decade.

CHALLENGES FOR THE HEALTH INDUSTRIES CLUSTER

Canada is competing with the world for investment, high value business activity, and research funding in many knowledge-based industries, including those linked to health care.

²³ Ference Weicker & Company, Table 2.19.

Broadly speaking, between 1988 and 1998, the global pharmaceutical industry went through a period of expansion both in manufacturing and clinical trial capacity. With high quality standards and an efficient workforce, Canada was able to attract a significant amount of investment during this era. More recently, however, the 1998 to 2008 period saw global pharmaceutical organizations consolidating their manufacturing operations in lower-cost jurisdictions such as India and China, and shifting clinical trials to countries such as Brazil and Russia due to quality, speed and lower costs. In this more competitive global environment, local investment conditions and incentive structures are more important than in the past. British Columbia is well-positioned to become a centre for health innovation, and there is real potential for the health innovation cluster to make a bigger economic contribution and help BC develop a more diversified export base. But in an era of intense global competition, success in attracting the necessary capital, talent and ideas will require coordinated support from industry, academia and government.

While BC already exports more health-related products than many people might expect, international comparisons show that, like Canada, the province has lagged in building a robust and internationally competitive health innovation cluster. In a path-breaking paper titled “Where are the Exports? The Canadian Health Care Mystery,” University of Toronto Professor Roger Martin identifies a striking shortfall in exports of Canadian health care products and highlights the paucity of large, globally competitive Canadian companies in this sector.²⁴ He characterizes the absence of a critical mass of significant health-related exporters as “puzzling,” given the vast sums of money that the country spends on health care services and health-related research.

Canada’s lacklustre performance as an exporter of health products and services is especially evident when looking at the American market. Even with the advantages of geographic proximity and extensive trading links, Canada is not a leading supplier of any imported

²⁴ Roger Martin, “Where are the Exports? The Canadian Health Care Mystery,” Joseph Rotman School of Management, University of Toronto (November 4, 2003).

health care products sold in the US.²⁵ In fact, based on average data over the past three years, Canada ranks fifth, just ahead of Switzerland and Mexico, in the value of health care goods sold to the US. In many other categories of manufactures (including vehicles, aircraft, ships and boats, furniture, paper and so on), Canada ranks as the first or second biggest foreign supplier to the US. And only recently did Canada manage to move ahead of Mexico in the sale of health products to the US, which is due mostly to the appreciation in the Canadian dollar rather than a large jump in the volume of health exports.²⁶ That Mexico, a developing economy with a per capita GDP far below Canada's, has outpaced Canada as an exporter in this high value-added, research-intensive industry underlines Canada's dismal record.²⁷

Another way of looking at the export shortfall is in terms of share of the American market. As shown in Table 5, over the 2005 to 2007 period 16.5% of all US merchandise imports came from Canada. But in the health sector, Canada supplied only 6.3% of the products imported for use in the American health care system. In most other advanced countries these proportions are reversed, with the foreign country's share of US health care imports exceeding its share of total US imports. Among the countries listed in the table, only Canada, China and Mexico have a lower share of the US health care market relative to their share of total US imports.²⁸

²⁵ US Department of Commerce, Trade Stat Express Database. Health care exports are based on the following 4-digit HS categories: Antibiotics (2941), Glands and other organs, heparin and its salts (3001), Blood and blood preparations, vaccines etc. (3002), Medicaments not dosage form (3003), Medicaments dosage form (3004), Dressings and similar articles (3005), other preparations for pharmaceutical use (3006), Instruments and appliances used in medical, surgical, dental or veterinary sciences (9018), Mechano-therapy apparatus & massage appliances (9019), other breathing appliances and gas masks (9020), Orthopaedic and other appliances worn or implanted in the body (9021), Apparatus based on the use of radiation (9022).

²⁶ Measured in US dollars, Canada's health product exports have surged ahead of Mexico's over the past two years. The comparatively strong gain is largely attributable to the steep rise in the Canadian dollar relative to the US dollar, which means it now takes more US dollars to buy Canadian health care products. This increases the value of health exports measured in US dollar terms. In contrast, over the past three years the Mexican Peso has not appreciated relative to the US dollar.

²⁷ According to the IMF, on a purchasing power parity (PPP) basis Canadian GDP per capita is three times higher than Mexico's.

²⁸ Energy products (oil, natural gas and electricity) make up a significant part of Canadian exports sold to the US, but even when these categories are excluded from the total Canada's share of all US imports is still 12.6%, well ahead of the 6.3% market share for health products.

Table 5
US Imports of Health Care Products by Country of Origin, average 2005-07

Country of Origin	<u>US Imports Health Care Products (millions US\$)</u>	Share of US Health Care Imports (%)	Share of All Goods Imported to the US (%)
World Total	65,776.0	100.0	100.0
Germany	9,996.5	15.2	4.9
Ireland	9,748.0	14.8	1.6
United Kingdom	6,024.3	9.2	2.9
France	4,706.2	7.2	2.1
Canada	4,113.3	6.3	16.5
Mexico	3,790.0	5.8	10.6
Japan	3,398.3	5.2	7.9
Switzerland	3,132.5	4.8	0.8
Italy	1,791.8	2.7	1.8
China	1,580.4	2.4	15.6

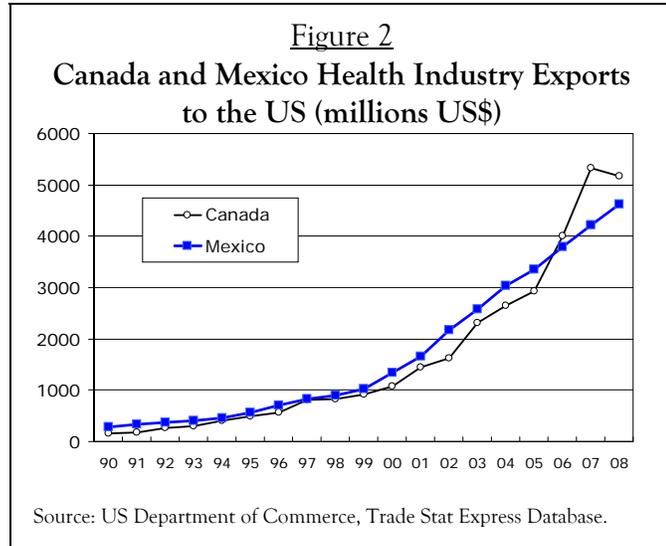
Source: US Department of Commerce, Trade Stat Express Database.

So why is Canada, and by extension British Columbia, saddled with an underdeveloped health care export sector? Why isn't a country as wealthy and technologically sophisticated as Canada, with good universities and excellent researchers, selling more health care-related products to its largest trading partner (and, by implication, to other foreign markets)? While many factors are no doubt at play, Roger Martin makes a compelling case that the explanation mainly lies in the fact that market conditions which typically spur companies (and industries) to innovate and become more productive simply don't exist in the Canadian health care system.

Even though large outlays on health care would seem, at first glance, to create an environment conducive to helping Canadian firms selling health-related products and services to grow, the reality is that support for new, innovative health-related products is virtually negligible in Canada. Companies selling innovative health products and services face a single intermediate buyer (either the provincial government or regional health authorities in BC). Economists recognize that this type of market structure inhibits innovative behaviour. "In the Canadian health care sector, the monopsonist buyer tends to act as a demanding but not sophisticated buyer."²⁹ A preoccupation with cost containment

²⁹ Roger Martin, op. cit., p.9.

means negotiating lower prices is always and everywhere the foremost concern. In such an environment, there is little reason (or opportunity) to introduce new products, innovative ideas, or better systems. The prevailing market setting is unattractive for innovators because such firms tend to compete on the basis of providing a better product or service. Monopsonist buyers



typically are hesitant to try new products, and this especially so in Canadian health care system where ever-present budgetary issues makes staying with what is known preferable.

A single buyer worried solely about costs also pushes suppliers to compete on price alone. In other industries where this type of “commodity effect” operates, companies often have the potential to incorporate benefits that differentiate their product offerings from those of other suppliers so as to compensate for higher prices. Yet the Canadian (and BC) health system also undercuts this strategy. The ability of suppliers of health goods/services to create complex value propositions – for example, offsetting an increase in drug costs by demonstrating a reduction in hospital costs or better overall health outcomes – normally doesn’t exist, as a result of the budgetary silos and rigid administrative structures prevalent within the health system.

In Canada, the largest purchasers of health care products are also monopolist suppliers of most health services. This structure further inhibits opportunities for suppliers to market new products or enhanced services, or to demonstrate new value propositions. That Canadians generally face a single supplier for health care services carries with it the classic monopoly traits of stifling innovation, avoiding competition, and instilling a culture of risk aversion. As Roger Martin argues,

“[m]onopolists really don’t need to be highly responsive to the demands of their customers, the Canadian health care recipients. In fact, by and large, the monopoly health provider isn’t responsive. It dictates what drugs are on the formulary, what medical devices can and cannot be purchased, and how long waiting periods need to be to minimize costs to the system. In this sort of environment, the intermediate customers – health care providers [hospitals, clinics, doctors, nurses] – don’t feel the compelling need to have fabulous new ideas from their suppliers.”³⁰

Although Canada has a similar overall market share as Mexico for health care products sold in the US (and lags behind Mexico in many individual categories), one area where we do outperform Mexico is in dental equipment and supplies. Although there may be other reasons for this comparative export success, it warrants mention that this segment of the Canadian health care system is not characterized by a monopolist supplier and a monopsonist buyer market structure, nor is it subject to the market access restraints that characterize the health care system generally.

The capacity to advance new discoveries to and through the commercialization stage is critical to building a successful health innovation cluster. Although BC excels in research and has a good record in new discoveries (the seeds of commercialization), the structure of the health system, and the behaviour of and incentives facing the institutions that dominate it, do not foster an environment that facilitates progression to the next steps in the commercialization process. This disconnect contributes to the by-now common situation where the most attractive option for many local firms that have made new discoveries is to be acquired by a foreign buyer. Indeed, the pattern is sufficiently widespread that Canada has become well-known as a source of “off book” research for global pharmaceutical/healthcare companies.³¹ Policy-makers should be concerned about this trend, both because it thwarts efforts to develop a larger, more export-capable health innovation cluster, and also because the net result is a “poor return” on the hundreds of millions of dollars which taxpayers invest in health research and the tens of billions more which governments spend to provide health services.

³⁰ Ibid., p.9.

³¹ Ibid.

Commercial success in the life sciences (and, to a lesser extent, in other health industries) is also challenged by high research and development costs and long product development cycles. Because of the high costs of R&D, life sciences companies tend to focus on a single product and practice sequential, rather than parallel, product development. This approach adds significant risk, which in turn makes it harder to attract investors. While this issue is distinct from the problems stemming from the structure of the health care system, the fact that the monopsonist buyer is overwhelmingly focused on cost containment and reluctant to try innovative products developed by local companies increases the risks linked to new product development. It stands to reason that when BC life sciences and health products companies receive little or no support in their domestic market, it becomes harder for them to do business in foreign markets.

In sum, the structure of the health care system and the behaviour of health administrators and authorities work against the creation of a dynamic health innovation cluster in BC. The obstacles that the system presents to innovative local suppliers are not insurmountable, however. As discussed below, there are ways that government and industry can work together within the existing health care system to help fashion an environment that is supportive of commercialization and more open to innovative products, technologies and ideas.

Biomedical Sciences: Singapore's Fourth Pillar of Economic Development

Singapore is a small city-state with a population of approximately 4.7 million. Towards the end of the last century, in response to growing competition from other parts of Asia in its traditional manufacturing sectors, the government of Singapore adopted explicit policies to diversify the economy. It focussed particular attention on becoming Asia's premier knowledge-based and high-tech economy, which included plans to develop a world-class biotech sector. In 2000, Singapore's Biomedical Sciences (BMS) initiative was launched to establish medical sciences as the fourth pillar of Singapore's industry cluster, alongside electronics, chemicals and engineering.

A fundamental feature of Singapore's plan is its holistic approach to the sector's development. The BMS initiative encompasses pharmaceuticals, biotechnology, medical technology and healthcare services. These four individual industries are grouped together and treated as one cluster because they are recognized as having synergies in human healthcare. Singapore has built world-class capabilities across the entire value chain, from clinical research and drug discovery to manufacturing to healthcare delivery. The Economic Development Board (EDB) is the lead government agency for planning and executing strategies to enhance Singapore's position as a global business centre. The EDB's Biomedical Sciences Group is responsible for the development of the biomedical sciences industry. For the period 2006-2010 the organization had a budget of SGD 2.1 billion (Cdn\$1.5 billion).

Building the biomedical and health research base is one of the foundations of the sector's development strategy. Consistent with the integrated approach, health research priorities are determined by public health needs as well as opportunities to contribute to the country's economic competitiveness. To facilitate research and attract human capital and international investment, Singapore's government has supported the development of large-scale bio-medical R&D infrastructure. A vivid icon of the government's commitment to the BMS initiative is the Biopolis, an integrated seven-building R&D complex comprising 185,000 square metres and linked with sky bridges. The Biopolis is intended to become the epicentre of biomedical research in Singapore. It houses a full spectrum of R&D activities including basic foundation science, translational medical research, drug discovery efforts, and medical technology research, related support services as well as cafes, shops and amenities to foster a 'work, live and play' collaborative environment where ideas are exchanged among researchers. It is strategically located next to the Singapore Science Park, which also hosts pharmaceutical and biotech R&D and the National University Hospital, which is Singapore's top research hospital.

Singapore's approach also leverages its world-class healthcare system in cluster development. Singapore was ranked first in Asia and sixth in the world for healthcare by the World Health Organization, yet it spends less than 4% of GDP on healthcare (Canada spends about 11% of GDP on healthcare). The public healthcare institutions in Singapore are wholly owned by the government but run as private companies. They are subject to broad policy guidance from the Ministry of Health and receive subsidies to pay for patient services, but have management autonomy for all decisions. Over the first half of the decade, health care services output grew by 50%, the largest gain within Singapore's services sector. Some of this was attributable to rapid growth in "exported" healthcare services. In 2006, some 400,000 foreign patients were treated in Singapore. The government's target is to increase this number to 1 million by 2012.

Sources: Marjanovic, Sonja and Siobhán Ni Chonaill, "Health and Medical Research in Singapore" RAND and Singapore Economic Development Board www.sedb.com.

LEVERAGING STRENGTHS: RECOMMENDATIONS TO SPUR THE DEVELOPMENT OF THE HEALTH INNOVATION CLUSTER

As noted above, in important ways British Columbia's health care system stymies innovation and the commercialization of locally-developed products, ideas and technologies. Yet, the system also has strengths that reflect the presence of unique and specialized health care delivery models, powerful databases and data collection systems, and tools for sophisticated analysis. Some of these advantages are being exploited, but better use can be made of the relevant attributes of the public health care system. The largely untapped potential to develop groundbreaking integrated commercialization models is particularly promising and could do much to leverage BC's research base and stimulate the growth of the life sciences and the health innovation sector.

Translational Research: BC Cancer Agency (BCCA)

The British Columbia Cancer Agency (BCCA) exemplifies a "translational research" organizational model. It links the pathway from discovery research to improved health outcomes and uses information to drive research. This "bench-to-bedside" approach covers the full spectrum of discovery research (also called "basic" research), clinical research and population applications. BCCA receives funding for cancer control programs from the Ministry of Health through the Provincial Health Services Authority (PHSA). Cancer research funding is provided through the BC Cancer Foundation, Genome BC, research granting bodies and non-Ministry of Health provincial and federal grants.³²

This has proved to be an effective model for discovery and disease treatment, and is leading the way for predictive and personalized cancer medicine. It represents a unique model within the BC health care system (although it does share some characteristics with HIV treatment). Data collection and analysis are crucial to realizing the potential of predictive and personalized medicine. The BCCA is careful to ensure that all treatment and outcome data are used responsibly and that private information is protected. There is also scope for

³² BC Cancer Agency Strategic Plan, <http://www.bccancer.bc.ca/ABCCA/strategicplan.htm> - accessed November 6, 2006

additional research and discovery in the BCCA tissue bank (the Tumor Tissue Repository or TTR).

Data use is currently limited to providing feedback and direction for the translational research model used by the BCCA. However, the power of full spectrum and disease-specific health research and delivery models suggests that there is an opportunity to broaden the application of this data source.

Recommendation: Unique health models that exist within the province, such as the BC Cancer Agency, should explore the potential for additional data collection and use for the purpose of directing research within the public and private sectors and informing provincial health investment priorities for product innovation.

For example, with appropriate data collection and analysis (and guidelines for access and usage), it would be possible to explore the full value chain of cancer disease management and to identify high-benefit areas for applying new technologies along the diagnosis-to-treatment spectrum. Capacity for data collection, access and usage could be developed as an extension of the model within the agency, to avoid the difficulties and ethical challenges associated with data-sharing across organizational boundaries.

Many benefits can come from enhanced data collection and use. Technology application derived from such analysis could help provide direction to research and serve to validate private sector R&D activities. For the private sector, additional potential market validation could boost investor confidence and perhaps reduce the high level of risk inherent in new life sciences ventures. In addition, broadening the use of this data source would bolster new technologies that support the translational research model, rather than competing directly with the BCCA model for basic discoveries. Importantly, improving the scope and benefits of translational research may strengthen and speed commercialization in both the private and public sector research environments. The additional validation of private sector research may also stimulate more private sector R&D investment in the province.

BC Linked Database and PharmaNet: New Directed Opportunities

The BC Linked Health Database (BCLHD) integrates health service records, population health data and census statistics, making it possible to link individual administrative records while maintaining anonymity. The data is collected and controlled under the direction of the Ministry of Health and housed by UBC's Centre for Health Services and Policy Research (CHSPR). The BCLHD has been used in many health care and health services research projects.³³ The BCLHD contains a wide range of information including BC Medical Services Plan records, PharmaCare data on drug prescriptions (PharmaNet), hospital separations on discharges and transfers, Continuing Care service transactions, British Columbia Cancer Agency incidence files, WorkSafeBC injury reports, births and deaths registered within British Columbia, and mental health care episode records.

Use of the BCLHD and PharmaNet continues to expand to better serve British Columbians. In early 2007, changes to PharmaNet were implemented to make medication histories available to all authorized health professionals in hospitals and designated mental health facilities.³⁴ Additional changes to PharmaNet are underway to accommodate the provincial e-Health strategy and allow "e-Prescribing," which will link all prescribers in British Columbia through PharmaNet's central database.

This dataset could give researchers access to a remarkably rich source of information about British Columbians' interactions with the health care system. Critically, the data are linkable, thus allowing researchers to trace the experience of a group of individuals over time and across health programs. The Centre at UBC (CHSPR) believes that rules governing data release preclude the possibility of individuals ever being identified. CHSPR encourages and facilitates use of the BCLHD for research, and employs a public utility model to make the

³³ Quoted from the Centre for Health Services and Policy Research website accessed at <http://www.chspr.ubc.ca/node/3>, November 9th 2006

³⁴ BC Ministry of Health News Release (Dec.5 2006)

data available for research in the public interest. The BC Ministry of Health coordinates the approval process and has set strict access and usage guidelines for the BCLHD.

The BC Linked Health Database embodies the potential for better management of care and improved measurement of the appropriateness of care. It is also a way to connect key stakeholders within public health system – patients, health technology innovation providers, and hospitals. The Database holds open the possibility of enhancing disease management and developing new prevention programs.

Recommendation: Expand the collection and utilization of the BC Linked Health Database information to provide greater opportunities for British Columbia to target and validate public and private sector R&D activities and support clinical trials development and commercialization potential throughout the public and private sectors.

Translation of existing databases and specialized health care delivery models into platforms to encourage commercialization and, ultimately, support economic development requires rigorous measures to ensure privacy and governance solutions. Discussion of this issue is beyond the scope of this paper. It should be noted, however, that the protective mechanisms now in place would permit the development of controlled pilot programs.

Overcoming Marketplace Inhibitors to Health Innovation

British Columbia has technology transfer mechanisms in place to help take health research innovations from publicly-funded research domains into the private sector. But as discussed above, the movement of innovative products to the marketplace is hampered by poor domestic market access and limited opportunities for local companies to bring and test new technologies in the Canadian/BC health care context. Commercialization of publicly-funded research is also inhibited by the small number and slow growth of receptor communities in the private sector. Exporters across all industrial sectors routinely identify local adoption and use of innovative technologies and products as critical to their ability to market products in foreign markets. Finding ways to encourage and assist the introduction and adoption of new

locally-developed technologies and products must be part of any strategy to spur the further development of BC's health industries cluster.

One promising approach may be found in Alberta. There, the Edmonton Capital Health Authority has established an Office for Health Innovation (OHI) “to simplify and manage the process of the introduction and use of new, innovative technologies.”³⁵ The agency was created in response to a recommendation from a Capital Health Authority study indicating that local suppliers “were interested in gaining access to Capital Health's internal resources for the purpose of product development and evaluation.” A key feature of the OHI is that it provides a single point of entry for local businesses, inventors and researchers for the evaluation of innovative ideas. The two main strategies used by OHI are health technology assessment and business development/commercialization.

A similar initiative in BC would assist local companies with the introduction and validation of new health technologies and products and expand opportunities to demonstrate support of a large, nationally-branded reference client (the provincial health system) to international customers and investors.

Recommendation: The province (or the appropriate health authorities) should consider establishing “Innovation Offices” with independent operating budgets within the different regional health authorities. The mandate of these offices would explicitly include helping innovative BC companies gain access to the province’s health care system to assist with product development and evaluation. Substantively, this recommendation differs from the BC government’s recent decision to establish a \$100 million “innovation fund” for use by the health authorities.

The proposed offices should be relatively simple to create and would not alter the structure of the health care system. An article in the National Review of Medicine quotes Canadian

³⁵ <http://www.capitalhealth.ca/InnovationandResearch/OfficeofHealthInnovation/default.htm> - accessed Oct 10 2006.

Healthcare Association President Sharon Solzberg-Gray: “We don’t want to mix up the privatization agenda and this one, but rather see the health system as a positive driver and not just a drain.”³⁶ This sentiment is aligned with the philosophy of the Canadian Health Industries Partnership (CHIP) and, if widely adopted, would do much to encourage the development of a more globally competitive and commercially savvy health innovation cluster. The objective is to create an environment where there is competition for new products and systems and fewer obstacles to commercialization within the health care structure.

In recommending this change, one potential risk mitigation strategy is to run pilot projects that combine health care and any of the above mechanisms intended to support economic development opportunities in regions that currently have strong life sciences clusters. In Ontario, a relevant example is the Medical and Related Sciences (MaRS) Discovery District, which provides funding to “bring together best-in-class science with business and capital, creating opportunities for these communities to come together.... to turn ideas into products and partnerships.”³⁷ Of interest, the MaRS brand has become an essential component of Ontario’s efforts to position itself as an innovative leader in life sciences. Currently, British Columbia lacks such a brand.

Health System Cost Savings Through Innovative Collaboration

Given the understandable focus on cost management within the BC Ministry of Health, there is an opportunity to adopt an innovative approach to collaboration that has shown promise in other Canadian and US jurisdictions. This approach is built upon the foundation of disease management and looks to community partnership-based disease management for costly chronic diseases. The primary goal of such programs is to improve care and outcomes for patients. Additional benefits include cost savings for the health system, greater scope to introduce innovative products and ideas, and the generation of

³⁶ National Review of Medicine, “A corporate-government partnership for healthcare innovation,” Volume 2 No. 10 (May 30 2005).

³⁷ MEDT; MaRS Discover District http://www.ontario-canada.com/ontcan/en/rts/rts_mars.jsp

program data that can inform further research and better measure outcomes. An example of this type of program was launched in 2001 as a partnership between the State of Florida and Pfizer Inc. The Florida: A Healthy State program ran for five years and supported patients through a state-wide network of community hospitals, civic organizations and patient advocacy groups. The program offered community level managed care education, counselling and medicines to address costly chronic diseases. Program outcomes included reducing Florida's medical costs by \$42 million during a 27-month period ending in September 2003. The program reached nearly 150,000 Medicaid beneficiaries while saving the state some \$61 million. In addition, Florida received about \$19.2 million in additional Pfizer investments and donated Pfizer medicines.³⁸ The program has since been transferred to the state of Florida to manage and oversee.

A similar program was launched in Canada with the Improving Cardiovascular Outcomes in Nova Scotia (ICONS) study. ICONS is a province-wide study of heart disease and is one of the largest studies ever undertaken to measure and improve health care for heart disease. Partners in this study include the Government of Nova Scotia (Department of Health), Community Health Care Professionals (physicians, nurses, and pharmacists), the Division of Cardiology, QEII Health Sciences Centre, and Merck Frosst Canada Inc. The budget for the study is \$6.2-million over five years, contributed by Merck Frosst. The aim is to examine whether using the most effective evidence-based practices to treat heart disease will measurably improve the health of Nova Scotians.

The benefits of initiatives such as ICONS include the alignment of health priorities with quantifiable studies and the ability to develop standards of care for chronic disease management that are more cost-effective and produce better outcomes using evidence-based therapies. Results of an economic impact study of ICONS found benefits for the Canadian and Nova Scotian economies. The analysis revealed that the \$6.2 million invested in Nova Scotia by the private sector donors generated an initial increase in Canadian wealth of \$5.3

³⁸ Florida: A Healthy State website <http://www.floridahealthy.org> (accessed May 8, 2007)

million and a total increase of \$10.2 million, including \$2.3 million returned to the different governments through direct and indirect taxes.³⁹

Recommendation: The BC Ministry of Health should collaborate with appropriate public health research bodies and private sector pharmaceutical and medicine manufacturing enterprises to develop community-based partnership disease management projects and studies, the outcomes of which could support increased private sector R&D investment as well as the development and commercialization of locally developed health research products.

Apart from direct benefits for patients and economic gains, these programs allow for quicker introduction of innovative products into the health system. Costs can be managed by monitoring and measuring outcomes. Such programs help drive new innovation by providing direction to researchers and health practitioners and by expanding the domestic market for new products. Cost savings could be channelled back to funding health services.

Identifying and Tracking the Sector

A basic challenge for British Columbia's health innovation cluster is the paucity of up-to-date and reliable data. This makes it harder to market BC's cluster in a competitive global marketplace, where many leading jurisdictions have identified health industry research and commercialization as an economic growth engine. Lack of data also makes benchmarking against OECD countries and other international standards impossible.

Recommendation: Industry and government in BC should collaborate on measurement and benchmarking of the health industries cluster, identifying appropriate global comparisons and developing an annual benchmarking report for the BC sector. A

³⁹ Pierre-Yves Crémieux, Pierre Fortin, Marie-Claude Meilleur, Terrence Montague and Jimmy Royer, "The Economic Impact of a Partnership-Measurement Model of Disease Management: Improving Cardiovascular Outcomes in Nova Scotia (ICONS)," *Healthcare Quarterly*, Volume 10, No. 2 (2007), pp. 38-46.

stronger foundation of data would be valuable for gauging progress and evaluating new policies.

The tourism and high technology industries in BC are examples of other sectors that present measurement challenges because, like the health innovation cluster, they are comprised of segments of different industries. In both instances, however, well regarded reports charting the performance of the industries are routinely produced by the province. Drawing on expert advice and a careful review of the relevant industries, a framework was developed to track growth in both of the sectors using industry data produced by Statistics Canada. Today, the annual BC Stats report on the province's high tech industry is widely used to monitor trends in the industry's output, sales, exports and employment base.

Addressing Market Access

A recent Life Sciences BC position paper discusses the impact on the local biotechnology industry and on opportunities for commercialization of BC-developed products of the preoccupation with cost containment in Canada's publicly-funded health care setting.⁴⁰ The paper urges an effort to explore "the economic benefits that would result from reducing or eliminating restrictive drug formularies." For a number of companies operating in BC's health innovation cluster, including some that have achieved a degree of global success, the difficulties of gaining access to the local market pose significant challenges in the product development cycle. These locally created barriers to market access work to keep the fruits of public and private sector research out of the domestic health care system. Among other things, the result is that BC firms are hampered in their ability to create local reference customers and build corporate and product credibility needed to increase investor confidence and support their efforts to penetrate other markets.

In 2007, the province formed a Pharmaceutical Task Force to advise government on "how best to maximize value for patients and value for money as well as ways to continuously

⁴⁰ Building World-Class Biotech Businesses in British Columbia: the Industry Position, 2006.

improve the pharmaceutical approval process.” In establishing the Task Force, the province took the initiative to take a fresh look at policies such as reference-based pricing and the Therapeutics Initiative that many industry participants believe reinforce the innovation-inhibiting features of the health care system. In keeping with the advice provided by the Task Force, the government has indicated it is no longer using the Therapeutics Initiative as an additional source to review drug therapies. Looking ahead, provincial policy-makers should take further steps to ensure that companies producing innovative medicines, medical devices, and other health-related products are not prevented from participating in the local market. More generally we believe BC can learn by carefully studying the policies and institutional practices of other jurisdictions that have built significant health innovation clusters to determine how to create a market environment that will support the commercial success of local innovative companies in this sector.

Recommendation: The provincial government should recognize that restrictive policies such as reference based pricing reinforce the innovation-inhibiting environment created by the monopolist and monopsonist market structure and put BC at a disadvantage compared to other jurisdictions in attracting research funding.

In addition to the recommendations outlined above, the province should adopt the following more general policies as part of broader industrial development framework designed to foster success and growth in the health industries cluster.

Further Recommendations

- Set a goal to grow the BC health industries cluster (more effective measurement is a prerequisite).
- Ensure that BC is an active participant in the Canadian Health Industries Partnership (CHIP) process.

- Examine and selectively borrow from the policies pursued in other jurisdictions that have been successful in developing globally competitive life sciences and health innovation clusters.
- Through shifts in Ministry mandates and personnel, build stronger in-house capacity and expertise on life sciences and bio-technology. Government needs to broaden its perspective on health care issues so that the economic development and wealth creation potential of thriving health innovation industries are factored into policy and resource allocation decisions.
- Establish a multi-stakeholder approach to further develop targeted policies and initiatives to advance the health innovation cluster. In addition to partnering with government, this should include inter-ministerial collaboration.

CONCLUSION

The time is right to consider how a dynamic health industries cluster can promote economic development and help to diversify BC's export base. British Columbia has an established health innovation cluster with some linkages to foreign markets. Although small, the cluster has elements that are growing quickly and provides a foundation to further develop the province's knowledge-based economy. Key areas of opportunity are life sciences and related health research, medical devices, information systems and other tradable services that are inputs into the provision of health care.

Through funding and tax credits, the provincial government has demonstrated support for the life sciences sector. The structure and behaviour of the institutions and actors in the public health care system, however, pose obstacles to the growth of BC's health innovation sector. The health care system is unique in its size, complexity and structure. As such, creative thinking and new approaches are needed to overcome barriers that hobble innovation and prevent the development of a more robust health industries cluster.

The promise of more innovation, commercialization, employment and income growth in health-related industries should not be underestimated. Globally, health related products and services are one of the fastest growing fields of international trade. Finding ways to unleash this potential through a strategy that better aligns the provision of health services with the development of local health innovation industries should be a priority for government. At a time when the province's resource-dominated export sector is struggling, the prospect of an expanding and globally competitive health industries cluster should be especially appealing.
