



FACULTY OF MEDICINE



DEAN'S TASK FORCE ON MD UNDERGRADUATE
CURRICULUM RENEWAL



APPENDIX A | MAY
2010



a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

Future of Health Care in Canada

**With specific reference to the demographics of British
Columbia**

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TABLE OF CONTENTS

Future of Health Care in Canada.....	4
Demographic trends	4
Advances in Science & Technology.....	5
Social and global trends.....	6
Implications for Health Care in Canada	8
Conclusions	11
Appendix A: Health Service Delivery Areas	13
Selected Health Indicators by Health Service Delivery Area	14
Bibliography	15



Future of Health Care in Canada

Predicting the future is fraught with risk and the future of health care is not exempt. Futurists develop scenarios derived from a set of assumptions and analysis of trends. In this paper, I will try to make explicit some of these assumptions and identify trends that I believe will have implications on the future of health care in Canada to be considered by the Task Force on MD Undergraduate Curriculum Renewal. I will focus on trends in demographics and technology and their impact on the various components of the health care system including the social determinants of health. Several broader societal themes will appear repeatedly, specifically globalization, lifestyle and sustainability.

Some would argue that the future is already here. At the end of the 20th century, scientific advances in an environment of economic growth produced monumental changes in our understanding of human biology, health and disease. This has presented challenges in health care delivery, compounded latterly by economic pressures. I may identify developments, trends and practices that are already making an impact on health care and medical education. To list them may appear repetitive, but to omit them would be a serious flaw.

Finally, there will inevitably be multiple competing scenarios and it will be important to remain flexible and responsive to change.

Demographic trends

Although currently a young population in comparison to other G8 countries, the population of Canada is ageing due to decreased fertility and increased life expectancy. Seniors (>65 years) will become more numerous than children around 2015, with the first cohort of baby boomers turning 65 in 2011. The proportion of the oldest seniors (>80 years) will increase sharply. Economic growth is slower in ageing populations principally due to the greater burden of dependency defined by Statistics Canada as the number of dependents ≤ 19 and 65+ for every 100 people in the working age population.¹

Population growth and particularly growth in the proportion of the working age population is dependent on net migration (globalization). By the year 2030, when deaths are expected to start outnumbering births, immigration will be the only source of population growth.

Canada already has an ethnically diverse population and this is likely to become more so in the 21st century. Currently, almost 20% of the Canadian population is foreign born, amongst the highest in the world (12.5% in the United States). In BC, this increases to 27.5%.² The pattern of immigration has

¹ [Statistics Canada: Health Profile - Definitions, symbols and source](http://www12.statcan.gc.ca/health-sante/82-228/2009/06/help-aide/DQ-QD04.cfm?Lang=E), 3/1/2010 2010
<<http://www12.statcan.gc.ca/health-sante/82-228/2009/06/help-aide/DQ-QD04.cfm?Lang=E>>.

² Statistics Canada, *Canadian Demographics at a Glance* (Ottawa: Government of Canada, Minister of Industry, 2008).



changed dramatically in the past century. Nationally, the share of immigrants from Eastern Europe, Asia and Africa more than doubled to 72% between 1981 and 2001. “The human capital of immigrants from more recent source regions may be initially less transferable because of the potential issues of language, cultural differences, education quality and discrimination.”³ BC has the largest proportion of visible minority persons in its population.⁴ In Vancouver 90% of visible minority persons are of Asian descent, with a much smaller Black, Latin American and Arab population than metropolitan Toronto and Montreal.

4.8% of the provincial population identify Aboriginal origin and 2.7% are registered under the Indian Act, greater than national rates of 3.8% and 2.0% respectively. The Aboriginal population is younger than the non-Aboriginal population in BC, with less formal education, lower employment rates and lower average earned income for full time employees at all levels of education.⁵ Due to its youth, this population is growing faster than the national average. While the Aboriginal population is ageing due to increased life expectancy and decreased fertility, this lags the national average so that the rather than heading to retirement, there will be a large number of young Aboriginal adults entering the labour market.

Health care workers will mirror to some extent the overall population in terms of demographics. More women are entering medicine and tend to work fewer hours per week than their male counterparts particularly during their early careers.⁶ Unemployment in the health care sector is lower than the general population and this is likely to continue however remains dependent on international mobility and economic sustainability.

Advances in Science & Technology

There has been enormous progress towards understanding the human condition from a biologic and scientific perspective. The very process of ageing is now seen a biologic process rather than a chronologic one.⁷ Discoveries are on an increasingly precise scale such that life and disease are understood at the

³ Garnett Picot, Immigrant Economic and Social Outcomes in Canada: Research and Data Development at Statistics Canada (Ottawa: Government of Canada, Minister of Industry, 2008).

⁴ Alain Bélanger and E. Caron Malenfant, Population projections of visible minority groups, Canada, provinces and regions. 2001-2017 (Ottawa: Government of Canada, Minister of Industry, 2005).

⁵ BC STATS: Statistical Profiles of Aboriginal Peoples, , 3/1/2010
<http://www.bcstats.gov.bc.ca/data/cen01/abor/ap_main.asp>.

⁶ Task Force Two, Canada's Physician Workforce: Occupational human resources data assessment and trends analysis. Final Report, 2005). P.85

⁷ Luigi Fontana, "Modulating human aging and age-associated diseases," Biochimica et Biophysica Acta (BBA) - General Subjects 1790.10 (2009): 1133-8.



genetic and molecular level. Medical science in the 19th century focused on anatomy; in the 20th century physiology and in the 21st century is increasingly focused on molecular biology.⁸

Uncovering the human genome has allowed scientists to look at common variation and identify risk factors for a number of diseases. Genetic biomarkers are being identified to tailor both type and dose of specific drug. A major exception to this is in the field of mental health where neither the genetic nor molecular basis is understood. It is more likely that science will recognize mental disorders not as discrete conditions with specific causes, but that "...psychiatric symptoms can arise from many causes and are more interrelated than current disease models allow."⁹

Advances in biomedicine have been facilitated and further enhanced by technology. Technologies that emerged in the latter part of the 20th century, such as fibre optics and digital imaging, are being advanced and incorporated with other technologies. Robotics are in use for some procedures, allowing for remote diagnosis, monitoring and even procedures. Computer systems are applied to genetic material in genomics and pharmacogenomics and to other biomolecules, for example proteomics. When applied to the physical sciences, such technology can design and produce advanced synthetic materials for use in diagnosis (microfluids) and treatment, from Teflon®grafts to advanced biomaterials for targeted drug delivery.

With all the new information available, it is important to be able to capture, store, use and communicate it effectively. Data in all forms can now be digitized, processed and shared over distance. Telemedicine is broadly defined as the use of telecommunications to allow caregivers to interact with patients and/or other caregivers operating at remote locations.¹⁰

Social and global trends

The World Health Organization defines the social determinants of health as the circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces: economics, social policies, and politics.¹¹

⁸ Martin Gleave, Advances in Cancer Research – From Bench to Bedside and Beyond. Presentation to the UBC Class of Medicine 1984 25 Year Reunion, 15 November 2009).

⁹ Weinberger, Daniel R. "Mental Health" In "2020 visions," Nature 463.7277 (2010): 26-32.

¹⁰ Kevin K. Chung, et al, "Robotic Telepresence: Past, Present, and Future," Journal of cardiothoracic and vascular anesthesia 21.4 (2007): 593-6.

¹¹ WHO | Key concepts, , 3/1/2010 2010

<http://www.who.int/social_determinants/thecommission/finalreport/key_concepts/en/index.html>.



The major demographic and social trends of the 19th and 20th centuries – industrialization and urbanization will continue to leave their mark on the 21st century. Upon a background of economic growth, scientific and technical advances and profound improvements in living conditions, there have also been changes toward a sedentary lifestyle, refined (“western”) diet, and environmental degradation including air pollution and global warming. While tobacco use is decreasing somewhat in Canada, it is increasing worldwide. Psychological stress from rapid social change as well as alcohol and other drug use result in both health and social problems.

Although now in recession, Canada and the world have recently witnessed an unprecedented period of strong economic growth. During this time, however, inequities in income have increased particularly in BC,¹² with child poverty rates above the national average. “There is also considerable inequity in the geographic distribution of poverty, socioeconomic disadvantage and educational concerns across BC. . . (with) the poorest regions (in) rural and northern areas of the province.”¹³

Globalization refers to the flow and exchange of goods, capital, labour and information.¹⁴ We live in a connected world both physically (through travel and migration) and virtually through communication and information technology.

Sustainability – the ability to be maintained and the knowledge that resources of all kinds are finite – can be applied to individuals, organizations (corporate sustainability), concepts (sustainable development) and to the planet (environmental sustainability). Advances are celebrated but can only be fully realized if they are affordable on an on-going basis.

The baby boomer generation have shaped the social dimension over the last 50 years and will continue to do so in the next few decades. This cohort has known economic prosperity and has been characterised by the principles of autonomy, consumerism and empowerment.¹⁵ With few exceptions, their career prospects have been secure. More recent generations however consider work-life balance more important than job security and are open to multiple career paths (lifestyle).

¹² Report Card of Child and Family Poverty in Canada: 1989-2009. Campaign 2000 Report Cards, 3/1/2010 <<http://www.campaign2000.ca/reportcards.html>>.

¹³ Health Officers Council of BC, Health Inequities in British Columbia Discussion Paper, http://www.bchealthyiving.ca/sites/all/files/HOC_Inequities_Report.pdf ed., November 2008). P.32

¹⁴ Roy J. Romanow, Building on Values: The Future of Health Care in Canada - Final Report Canada, Commission on the Future of Health Care in Canada, 2002). P. 233

¹⁵ Angela Towle, "Continuing medical education: Changes in health care and continuing medical education for the 21st century," BMI 316.7127 (1998): 301-4.



Implications for Health Care in Canada

The patient population is ageing. This cohort of seniors will not only be more numerous, but will also have different expectations of physicians and the health care system. While currently advocating for care for their elderly parents, these baby boomers will have high demands for their own care. The scope of care expected by this group includes not just basic, medically necessary needs but also the virtually infinite needs of health enhancements, such as cosmetics and lifestyle treatments (sustainability). This is compounded by the medicalization of many conditions, particularly in mental health.

Ageing is associated with degenerative diseases such as dementia, the presence of one or more chronic conditions, as well as an increase in non-cognitive mental health problems. Overall, deaths due to cancers, cardiovascular disease and other non-communicable diseases are expected to increase.¹⁶ Many chronic diseases such as hypertension, heart disease, diabetes, osteoarthritis and COPD as well as some cancers, share risk factors that can be largely prevented.^{17,18} Practitioners, public health organizations and society in general will focus on the reduction of risk factors related to a sedentary lifestyle, specifically obesity and inactivity as well as substance misuse including smoking, alcohol and other drugs.¹⁹ Preventive activities not only reduce individual morbidity and improve population health, but also have the potential to reduce the anticipated health care expenditure for these chronic diseases (sustainability).

Canada will continue to reflect a marked heterogeneity in the many determinants of health such as age, socioeconomic status, genetic/ethnic background, health literacy, behaviour and health care utilization. The Health of British Columbians rates better than the Canadian average on most markers such as infant mortality, life expectancy, incidence of cancer, diabetes and high blood pressure. British Columbians also have the lowest rates of smoking and obesity and highest rates of physical activity in the country. This can conceal the significant inequities that exist within the province by socioeconomic status and level of education. Life expectancy ranges not only between Health Authorities (see table, Appendix A) but also within them, from 83years+ in Richmond and the Westside of Vancouver to <75 years in the Downtown Eastside.²⁰ The prevalence of heart disease, diabetes and cancers in women are inversely proportional to household income quartiles whereas self-perceived health and mental health improves. The prevalence of smoking and obesity are inversely related to household educational level.

¹⁶ World Health Organization, The global burden of disease: 2004 update. (Geneva: WHO Press, 2008).

¹⁷ Fontana, 1133-8

¹⁸ World Health Organization, Global Health Risk: Mortality and burden of disease attributable to selected major risks (Geneva: WHO Press, 2009).

¹⁹ World Health Organization, 2009.

²⁰ Health Officers Council of BC, . P. 27



Amongst the First Nations risk factors for chronic diseases and disability are especially prevalent.²¹ Rates of smoking and obesity in First Nations adults living on reserve are more than double the national average. There are lower rates of overall alcohol consumption; however the proportion of First Nations adults living on reserve who report heavy drinking is again double the general population.

It is difficult to generalize about the effect of immigration. Although new immigrants tend to be healthier than the general population, this effect decreases over time. Migration and travel will change the epidemiology of some diseases, including the threats of pandemic communicable disease. Mobility also results in more nuclear families and fewer extended families with their systems of informal supports. It is possible that there will be a greater need for formal support from the health care system.

In addition to the chronic diseases, disability due to loss of vision, hearing and mobility will become more prevalent. Worldwide, depression contributes to the greatest number of years of life with disability (YLD)²² with alcohol and drug use disorders, dementia, diabetes and chronic lung disease including asthma also in the top ten.

Genomic and other biotechnologies as well as advanced digital imaging allow for earlier pre-symptomatic diagnosis and identification of a genetic predisposition. While earlier diagnosis and intervention can delay complications and disability (compression of morbidity) it may also increase anxiety, stress and illness behaviour (the experience of disease) with attendant mental health issues. Ethical issues will continue to arise from increased interest in embryonic and other screening programs.²³

Several other factors are driving a shift in the focus of health care from acute illness and injury to chronic disease management. Technologies have allowed for safer, less invasive methods of both diagnosis and treatment. Minimally invasive surgery has progressed with fibreoptics, microtechnology and advanced digital imaging. These advances, coupled with a desire to control health care expenditure, have shortened hospitalizations with more care occurring in the community and the home. This trend is likely to be expanded with advanced bio and communication technology.

Telemedicine will advance "... to include cell phones and Internet-based telecommunications tools for remote and home health management with video assessment, remote bedside monitoring, and patient-specific care tools with event logs, patient electronic profile, and physician note-writing capability."²⁴ Such remote presence not only expands diagnostic and monitoring capabilities into the home and

²¹ Health Canada, [A Statistical Profile on the Health of First Nations in Canada: Determinants of Health, 1999 to 2003](http://www.hc-sc.gc.ca/fniah-spnia/pubs/aborig-autoch/2009-stats-profil/index-eng.php), <http://www.hc-sc.gc.ca/fniah-spnia/pubs/aborig-autoch/2009-stats-profil/index-eng.php> ed., 2009).

²² World Health Organization, 2008.

²³ Goldstein, David B. "Personalized Medicine" in 2020 visions 26-32

²⁴ M. J. Ackerman, et al, "Developing next-generation telehealth tools and technologies: patients, systems and data perspectives." Telemed J E Health 16.1 (2010).



community but can allow for simultaneous care for multiple patients²⁵ with delegated responsibilities to other health care workers.

Minimally invasive diagnosis and treatment have also resulted in merging scopes of practice within the medical profession, for example interventional radiology. Some specialties could disappear as others are created or gain prominence. The desire to create efficiencies and promote quality may further the trend to subspecialisation and constricted scopes of practice. This will conflict with the focus on generalism and primary health care as adopted by the World Health Organization,²⁶ BC Ministry of Health,²⁷ the Association of Faculties of Medicine of Canada²⁸ and both the Romanow Commission on the Future of Healthcare in Canada²⁹ and the Senate Standing Committee on the state of the health care system in Canada, chaired by Sen. Michael Kirby.³⁰

These latter reports also identified challenges encountered as health occupations are changing their scopes of practice with changes to professional roles and boundaries. "Each profession appears willing to take on more responsibilities, but is unwilling to relinquish some duties to other professions."³¹

The effective management of complex and multiple chronic diseases requires longitudinal care coordinated by an interprofessional team. Team based practice will become the norm, not just within hospitals but in community. While this may entail co-location, information and communication technologies allow for the creation of virtual teams, with full remote access to patient centred documentation through point of care devices. While this technology already exists, its implementation requires widespread adoption of an electronic health record which has been slow.

Information and communication technologies are also fundamentally changing the physician:patient relationship. Early uses of the internet (Web 1.0) allowed both health care workers and patients to access medical information, albeit of varying quality. Using Web 2.0 with its networks of user generated content, patients are able participate actively in their care through interaction with health care workers. Patients are not only better informed about their condition and care, but are also able to interact with

²⁵ Chung, et al, 593-6

²⁶ WHO | Primary health care, 3/1/2010 2010 <http://www.who.int/topics/primary_health_care/en/>.

²⁷ BC Ministry of Health Services Primary Health Care, Government of BC, Ministry of Health Services, 3/1/2010 2010 <<http://www.primaryhealthcarebc.ca/phc/>>.

²⁸ Future of Medical Education in Canada, AFMC, 3/1/2010 2010 <<http://www.afmc.ca/fmec/>>.

²⁹ Romanow,

³⁰ Canada, The Standing Senate Committee on Social Affairs, Science and Technology., Interim Report on the state of the health care system in Canada: The Health of Canadians – The Federal Role Government of Canada, 2002).

³¹ Romanow, . P. 31



other patients (virtual communities). Nevertheless, not all patients will choose or be able to take advantage of these opportunities and physicians will be required to adapt their interaction to the specific circumstances.³²

Structured care (care plans) have gained prominence driven by quality of care, including patient safety and cost effectiveness and enabled by the scientific focus on evidence based care. This contrasts with the potential for individualized medicine through genetic biomarkers and targeted therapies including pharmacogenomics. Rather than discarding evidence based care, it is likely that care algorithms will evolve to include a variety of risk factors and other patient specific information including genetic biomarkers. The large amount of clinical information stored on electronic health records will be able to facilitate development and refinement of these individualized care plans.

It is important to remember that health care is more than just the application of biomedical science and technology to a specific problem. Physicians are not only applied scientists and medical experts but integrate the roles of collaborator, communicator, health advocate, manager, scholar and professional in the provision of patient centred care. So while the technology exists, it is unlikely robotics will replace health care workers in the near future. Robotic assisted surgery and remote surgery, with real-time guidance through advanced digital and magnetic resonance imaging are more likely to be expanded.

Finally, health care workers are also ageing and retiring. While they are being replaced by a new generation of workers, there is some evidence that there are workload differences between older and younger physicians, even when adjusting for gender and specialty.³³ The contraction of the economy from an ageing population may result in all workers, including health care workers, extending their working lives.

Conclusions

What does this mean for the Dean's Task Force on MD Undergraduate Curriculum Renewal? In addition to the three themes that will dominate the future of health care in Canada: ageing, chronic disease (both physical and mental illness) and collaborative care, physicians of the future will also need to work in a context of diversity and uncertainty.

There is a great diversity in the patient population, its genetic make-up, health literacy, cultural understanding of health as well as social and health inequities. There is a diversity of disease as new

³² Marie-Therese Lussier and Claude Richard, "Because one shoe doesn't fit all: A repertoire of doctor-patient relationships," *National Literature Reviews, Environmental Scan Project, Future of Medical Education in Canada*, ed. Wilson Centre for Research in Education, University of Toronto and Centre de pédagogie appliquée aux sciences de la santé Université de Montréal, <http://www.afmc.ca/fmec/activities-env-literature.php> ed. Funded by Health Canada, 2009) 450-456.

³³ Canadian Institute for Health Information, *Canada's Health Care Providers, 2007* (Ottawa: CIHI, 2007). p. 63

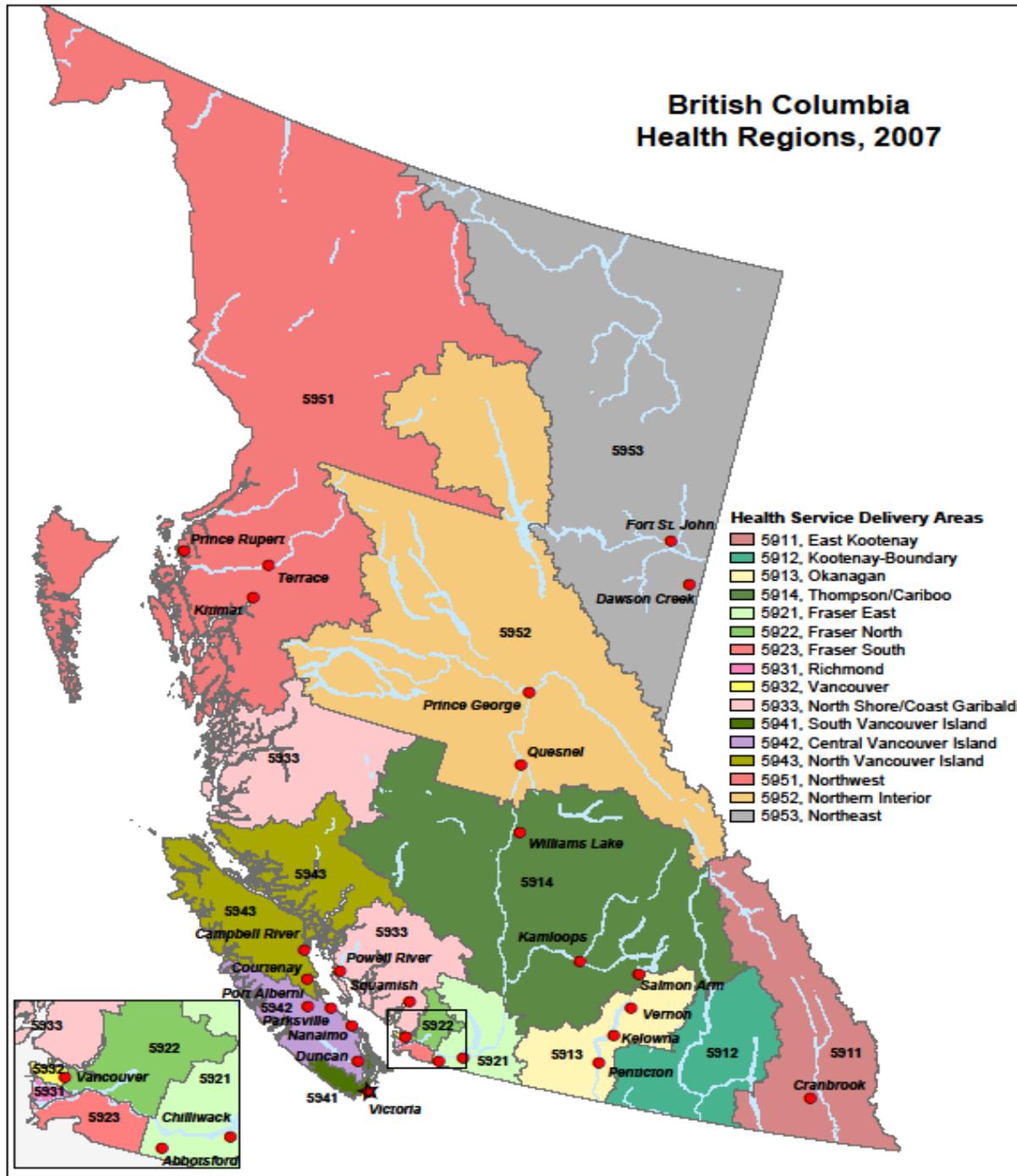


disease processes are uncovered and old diseases persist or re-surface. There is a spectrum of knowledge, from the minute details of proteomics to initiatives on a population scale. Physicians will work in diverse care settings requiring collaboration with a broad group of care providers both formal and informal.

Despite huge strides in understanding, there are still areas that will continue to challenge our understanding, particularly in the realm of mental health. The only real certainty is change and it will be important for physicians of the future and the institutions that train and govern them will need to be flexible and responsive to change.



Appendix A: Health Service Delivery Areas



Selected Health Indicators by Health Service Delivery Area

	Canada	BC	VCHA			VIHA			FHA			IHA					NHA				
			Vancouver	Richmond	NS/Garibaldi	VI South	VI Central	VI North	Fraser North	Fraser South	Fraser East	Okanagan	Thompson	Cariboo	Kootenay	Boundary	East	Kootenay	Northern Interior	Northwest	Northeast
Births/Deaths																					
Life expectancy at birth	79.5	80.4	80.7	<u>83.4</u>	81.4	80.7	79.6	79.4	80.7	80.9	79.7	80.6	78.6	79.6	79.4				78.1	<u>77.7</u>	<u>77.7</u>
Infant mortality	5.3	4.1	3.8	4.4	3.8	4.1	4.8	5.8	<u>3.2</u>	4.5	3.6	3.5	5.8	5.3	3.7				3.5	5.4	<u>7.1</u>
Low birth weight	5.6	5.2	5.4	5.0	4.6	5.1	4.8	4.9	5.3	5.4	4.9	5.3	5.6	6.0	5.2				5.3	<u>4.0</u>	<u>5.7</u>
Unintentional injuries	25.6	29.3	27.6	<u>16.2</u>	22.5	27.7	31.5	41.8	20.4	24.8	32.7	33.4	51.7	44.7	43.1				49.4	54.5	<u>68.9</u>
Suicide	11.3	10.4	10.9	<u>6.6</u>	9.6	11.4	12.3	13.3	9.4	7.4	11.4	12.4	13.8	13.8	<u>16.7</u>				11.3	13.7	7.0
Health Conditions																					
Overweight or obese	51.1	45.1	30.2	<u>29.3</u>	42.4	46.0	49.3	58.0	47.3	45.0	52.7	41.2	58.5	50.2	57.2				63.1	<u>64.7</u>	60.9
Arthritis	15.3	14.7	11.6	<u>10.7</u>	15.2	15.3	20.0	<u>22.1</u>	12.7	12.2	14.3	21.7	14.9	13.2	19.2				15.8	14.0	17.6
High blood pressure	16.4	14.7	13.1	<u>17.1</u>	12.2	15.9	16.5	16.8	16.3	14.0	13.3	16.1	14.9	14.5	14.5				12.3	15.1	14.1
Health Behaviours																					
Current smoker	21.4	18.6	15.1	<u>11.1</u>	16.2	15.6	23.3	23.2	19.0	17.7	16.8	23.7	22.7	25.0	22.2				21.6	20.3	<u>28.3</u>
Heavy drinking	16.7	15.5	14.8	<u>7.3</u>	20.4	16.8	17.7	17.0	14.0	12.9	12.3	15.6	19.7	18.5	<u>28.3</u>				17.9	15.7	17.0
Community																					
Dependency ratio	59.0	57.1	<u>42.6</u>	52.5	58.9	57.2	67.2	61.6	52.1	59.7	67.2	<u>68.9</u>	61.5	62.4	61.0				56.9	61.8	57.4
Aboriginal population	3.8	4.8	2.0	0.7	4.4	3.3	7.9	8.9	1.9	2.1	5.7	4.6	11.3	4.1	5.7				13.1	30.0	12.4
Immigrant population	19.8	27.5	45.6	57.4	28.3	19.3	14.9	12.1	37.8	32.3	20.0	14.4	10.4	11.3	10.5				9.5	11.4	7.0
Childhood low income	17.5	19.3	<u>28.9</u>	31.2	15.6	13.6	17.0	17.9	22.5	19.4	16.2	15.4	15.1	16.9	15.9				15.0	17.8	<u>9.3</u>

Best

Worst

Notes: Data from Census Canada 2006 and Birth & Death Notices 2000 - 2002. Obesity based on BMI; Arthritis and High blood pressure based on reported diagnosis; Smoking and drinking self report from Canadian Community Health Survey, 2008. Dependency ratio: number 0-19 and 65+ per 100 working age population.

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Science & Technology

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Task Force Two. Canada's Physician Workforce: Occupational Human Resources Data Assessment and Trends Analysis. Final Report., 2005.

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