

Nutrition and Physical Activity Situational Analysis

A Resource to Guide Chronic Disease
Prevention in Alberta

March 2010

Acknowledgements

In an effort to support the development of comprehensive strategies for preventing chronic diseases related to nutrition, physical activity and weight management in Alberta, the Alberta Health Services Public Health Innovation and Decision Support Division conducted a Situational Analysis. This report serves as a point-in-time (Snapshot) resource to guide the primary prevention of cancer, type 2 diabetes, and cardiovascular disease through individual behaviour change, implementation of health-promoting public policy, and the mobilization of communities to create environments where healthy choices become easier choices.

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Glossary of Terms

Aboriginal	The three main groups of Aboriginal peoples in Canada: the First Nations, the Inuit and the Métis.
Acceptable Macronutrient Distribution Range	A range of intakes for a particular energy source (protein, fat, carbohydrate) that is associated with a reduced risk of chronic disease while providing adequate levels of essential nutrients.
Active Transportation	Refers to any type of human-powered transportation such as walking, cycling, in-line skating, skateboarding, or skiing.
Alberta Active Living Strategy	23 recommendations intended to promote active living in communities, schools and workplaces across the province established by the Active Living Task Force of the Alberta Ministry of Community Development.
Alberta Diabetes Strategy	A 10-year strategy established in 2003 by Alberta Health and Wellness in response to and with support from the Canadian Diabetes Strategy. The ADS takes a population health approach to address type 2 diabetes across the lifecycle, with the goal reducing the incidence of type 2 diabetes in Albertans by 10% by 2013.
Alberta Provincial Stroke Strategy	A province-wide initiative that is focused on inter-regional collaboration for the delivery of stroke care, the promotion of population health, the development of healthy communities, and the management of chronic diseases.
Body Mass Index	An indicator of body weight status that is calculated by dividing the weight of a person in kilograms by the squared height of that person in meters.
Canadian Community Health Survey	A cross-sectional, nationally-representative survey conducted every 2 years by Statistics Canada to collect information related to health status, health care utilization and other health determinants.
Canadian Diabetes Strategy	A national strategy established in 1999 intended to improve diabetes outcomes and prevention through policy change, health promotion and education, improved access to services, research and evaluation, and surveillance.
Canadian Heart Health Strategy and Action Plan	PHAC pan-Canadian strategy to reduce the incidence of and mortality from heart disease, stroke, and other vascular diseases.
Canadian Partnership Against Cancer	Collaborative networks of experts that contribute cancer control knowledge and expertise that help to coordinate national, provincial and territorial efforts in the areas of: primary prevention; screening; cancer guidelines; cancer journey; health human resources; research; and surveillance.
Canadian Strategy for Cancer Control	National and provincial coordinated approach to managing cancer developed by the Public Health Agency of Canada.
Canadian Stroke Strategy	A joint initiative of the Canadian Stroke Network and the Heart and Stroke Foundation of Canada established in 2006 which takes an integrated and interdisciplinary approach to addressing the full continuum of stroke care (prevention, treatment, rehabilitation, and community reintegration) through the implementation of evidence-based best practice.
Coefficient of Variation	A statistical term defined as the ratio of the standard deviation to the mean.

Contingent Valuation Method	A method used to calculate indirect healthcare costs associated with a certain illness that accounts for the amount an individual would pay to reduce the probability of illness or mortality.
Convincing evidence	Epidemiological studies show consistent associations between exposure and disease, with little or no evidence to the contrary.
Dietary Reference Intakes	A set of reference values for intakes of various nutrients for each life stage and sex group that were developed by a joint committee of Canadian and US scientists. The DRIs encompass tolerable upper intake levels, acceptable macronutrient distribution ranges, estimated energy requirements, estimated average requirements, acceptable intakes, and recommended dietary allowance.
Direct Healthcare Costs	The value of goods and services for which payment is made and resources are used in the treatment, care, and rehabilitation related to illness or injury. Direct cost components include expenditures on hospital care, drugs, physician care, and care in other institutions, and other components such as capital investments and public health.
Dose Response	The change in effect (i.e. in an individual's risk of chronic disease) caused by differing levels of exposure (i.e. when certain foods are consumed in different amounts). This effect can either be positive (risk-reducing) or negative (risk-increasing).
Ecological Model	Behavioural change theory which emphasizes the influence of the environment 'outside the individual' on behaviour, and considers the establishment of community partnerships necessary for removing barriers to participation in healthy eating and physical activity.
Former drinkers	People who reported having consumed an alcoholic beverage but who no longer drink (on the 2007 CCHS).
Global Report	The World Cancer Research Fund/American Institute for Cancer Research 2007 report entitled Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective.
Health Belief Model	Behavioural change theory which postulates that for behaviour change to occur, an individual must believe that their health is at risk, perceive the risk to be serious, believe that the benefits of the health behaviour outweigh the costs, and feel the need to take action. This model can help tailor the content of health education interventions to participants' health beliefs.
Healthy Body Weight	Also referred to as normal body weight, it is a body weight that is most conducive to good health, defined by a BMI between 18.5-24.9 kg ² /m.
Human Capital Method	A method used to calculate indirect healthcare costs that is known to produce conservative estimates and measures the value of lost productivity as a result of disability and premature death from illness or injury, using lost earnings as a surrogate for the impact that premature death and disability have on individuals and society.
Impaired Fasting Glucose	A pre-diabetic state in which an individual's blood glucose levels, are between the normal level and the level required for a diagnosis of diabetes, as measured using a fasting blood glucose test.

Impaired Glucose Tolerance	A pre-diabetic state in which an individual's blood glucose levels are between normal level and the level required for a diagnosis of diabetes, when measured using an oral glucose tolerance test.
Inactive	Leisure-time energy expenditure of less than 1.5 kilocalories per kilogram of body weight per day.
Inadequate vegetable and fruit consumption	Eating fruits and vegetables less than 5 times per day.
Indirect Healthcare Costs	The value of economic output lost as a result of illness, injury or premature death. Indirect cost components include those associated with short and long term disability as well as premature mortality.
Insulin Sensitivity	Refers to the sensitivity of the body's cells (muscle, fat, and liver cells) to the hormone insulin. In normal (non-diabetic) individuals, insulin stimulates these cells to clear glucose from the bloodstream, but in people with type 2 diabetes, insulin sensitivity is lower (e.g. these cells are insulin resistant) and glucose is cleared more slowly from the bloodstream.
Limited – no conclusion evidence	Evidence based on findings of a few studies which are suggestive, but are insufficient to establish an association.
Limited-suggestive evidence	Evidence based mainly on findings from case-control and cross-sectional studies, while insufficient randomized controlled trials, observational studies or non-randomized controlled trials are available.
Meta-analysis	The statistical analysis of a large collection of analysis results from individual studies undertaken for the purpose of integrating the findings.
Metabolic Equivalent (MET)	An indicator used to describe the intensity of a physical activity relative to a person's resting metabolic rate.
Moderate physical activity	Physical activity at an intensity level of 3 to 5.9 metabolic equivalents.
Moderately physically active	Leisure-time energy expenditure of 1.5 to less than 3 kilocalories per kilogram of body weight per day.
Modifiable risk factors	Risk factors that are amenable to change, and include behavioural factors such as poor diet, physical inactivity, and tobacco use, and related medical conditions such as hypertension and high blood cholesterol levels, among others.
Monounsaturated fat	A type of dietary fat (triglyceride) in which most of the fatty acids have one point of unsaturation (not fully saturated with hydrogen). Monounsaturated fats are liquid at room temperature and found in olive, canola and peanut oils, non-hydrogenated margarine, and certain nuts.
Never drinkers	People who reported 'no' to having ever consumed an alcoholic beverage (on the 2007 CCHS).
Non-modifiable risk factors	Risk factors that are inherent and cannot be changed, such as age, sex, and genetics.
Nutritious Food Basket	An indicator developed by Health Canada and used by stakeholders at various levels of government to monitor the cost and affordability of healthy eating. The National Nutritious Food Basket describes the quantity (and purchase units) of about 60 foods that represent a nutritious diet for individuals in various age and sex groups.

Obesity	A body weight that is associated with adverse health effects that increase in severity with higher levels of obesity. Obesity is defined by a BMI greater than 30 m/kg ² .
Occasional drinkers	People who reported having consumed an alcoholic beverage less than once per month (on the 2007 CCHS).
Ottawa Charter for Health Promotion	A document developed in 1986 in Ottawa at the first International Conference on Health Promotion. The Ottawa Charter called attention to the underlying conditions within society that determine health (peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice and equity). It also recognized that these prerequisites for health cannot be ensured by the health sector alone and that coordinated efforts are required from a number of governmental and non-governmental organizations.
Outcome expectancy	A central construct in social cognitive models of health behaviours that is widely used to explore physical activity behaviours; It refers to a person's belief about the likelihood of a particular behaviour leading to a specific outcome.
Overweight	A body weight that is associated with moderately elevated health risks, and is defined by a BMI between 25 and 30.0 m/kg ² .
Physically active	Leisure-time energy expenditure of more than 3 kilocalories per kilogram of body weight per day.
Polyunsaturated fat	A type of dietary fat (triglyceride) in which most of the fatty acids have at least 2 points of unsaturation (not fully saturated with hydrogen). Polyunsaturated fats are liquid at room temperature (oil), include the essential omega-3 and omega-6 fatty acids and are found in fatty fish, and certain seeds, nuts and vegetable oils.
Population Health Promotion Model	A model used to guide actions intended to improve population health that explains the link between health promotion and population health and shows how a population health approach can be implemented through action on the full range of health determinants by means of multiple health promotion strategies.
Primary Prevention	The prevention of diseases and conditions before their biological onset.
Probable Evidence	Evidence for which epidemiological studies show fairly consistent associations between exposure and disease, but there are perceived shortcomings in the available evidence or evidence to the contrary, which precludes a more definite judgment.
Recall error	Error that occurs when a respondent is unable to accurately recall or remember actual behaviour or events.
Regular drinkers	People who reported having consumed an alcoholic beverage at least once per month (on the 2007 CCHS).
Relative Risk	A statistical indicator referring to the ratio of the risk of disease in exposed individuals (e.g. people exposed to a certain risk factor such as physical inactivity or obesity) to the risk of disease in non-exposed individuals (e.g. people who are physically active or of a normal weight).
Saturated fat	A type of dietary fat (triglyceride) in which most of the fatty acids are fully saturated with hydrogen atoms. Saturated fat is solid at room temperature and is typically found in higher fat animal foods such as cheese, butter, and fattier cuts of meat and processed meats.

Secondary Prevention	The identification and interdiction of diseases that are present in the body, but that have not progressed to the point of causing signs, symptoms, and dysfunction.
Sedentary	Refers to physical inactivity, and activities of negligible intensity (no or very low metabolic equivalents) such as sitting, watching TV, using a computer, playing video games, and reading.
SMART goals	Goals which are Specific, Measurable, Attainable, Realistic and Timely.
Social Cognitive Theory	Behavioural change theory which recognizes that an individual's personal factors and environment (both social and physical) exist in a reciprocal relationship that reinforces influences on nutrition and physical activity behaviours.
Social desirability bias	Bias that occurs when research participants respond in a manner that will be viewed favourably by others (such as the interviewer) which can lead to an over-reporting of "good" behaviour and an under-reporting of "bad" behaviour.
Socioeconomic Status	Any measure which attempts to classify individuals, families, or households in terms of indicators such as occupation, income, and education.
Systematic Review	A form of research that involves synthesizing the results of a collection of primary research studies using methods that minimize bias and random error. Systematic reviews can be quantitative (e.g. include a meta-analysis) or qualitative (e.g. narrative overview of the evidence), or may combine both techniques.
Tertiary Prevention	The prevention of disease progression and attendant suffering after it is clinically obvious and a diagnosis established. This activity also includes the rehabilitation of disabling conditions.
Tracking Nutrition Trends Survey	A survey conducted by the CCFN every 2 years which investigates the nutrition and food-related attitudes and behaviours of Canadians 18 years of age or older.
Trans fat	A type of dietary fat that results from the chemical process of hydrogenation, in which hydrogen atoms are added to polyunsaturated fats. Trans fat is found in partially-hydrogenated margarine, and many packaged crackers, cookies and other baked products that contain partially-hydrogenated oils.
Transient Ischemic Attack	Also known as a mini-stroke, a transient ischemic attack occurs when a clot stops blood from flowing to the brain for a short period of time. Symptoms are short-lived, however a transient ischemic attack is an important risk factor for future strokes.
Underweight	A body weight that is too low for good health, defined by a BMI under 18.5 kg/m ² .
Vigorous Physical Activity	Physical activity at an intensity level of 6 metabolic equivalents or greater.
Western Diet	A dietary pattern that is generated by industrialized food systems and characterized by energy dense and processed foods, high in meat, refined grains, high-fat and fast foods.

Abbreviations

AAFRD	Alberta Agriculture, Food and Rural Development
AALS	Alberta Active Living Strategy
ACADRE	Aboriginal Capacity and Development Research Environments
ACAL	Alberta Centre for Active Living
ADS	Alberta Diabetes Strategy
AFFPA	Alberta Farm Fresh Producers Association
AFMA	Alberta Farmers' Market Association
AHEHEA	Alberta Human Ecology and Home Economic Association
AHLN	Alberta Healthy Living Network
AHPRC	Atlantic Health Promotion Research Centre
AICR	American Institute for Cancer Research
AMDR	Acceptable Macronutrient Distribution Range
APHA	Alberta Public Health Association
APSS	Alberta Provincial Stroke Strategy
AUMA	Alberta Urban Municipalities Association
BFFL	Be Fit For Life Network
BMI	Body Mass Index
CalPMA	Calgary Produce Marketing Association
CBPP	Canadian Best Practices Portal for Health Promotion and Chronic Disease Prevention
CCFN	Canadian Council of Food and Nutrition
CCHS	Canadian Community Health Survey
CCO	Cancer Care Ontario
CCS	Canadian Cancer Society
CDC	Centre for Disease Control and Prevention
CDPAC	Chronic Disease Prevention Alliance of Canada
CDS	Canadian Diabetes Strategy
CHHS-AP	Canadian Heart Health Strategy and Action Plan
CIHI	Canadian Institute for Health Information
CIHR	Canadian Institutes of Health Research
CPAC	Canadian Partnership against Cancer
CPHI	Canadian Population Health Initiative
CPMA	Canadian Produce Marketing Association
CSCC	Canadian Strategy for Cancer Control
CSEP	Canadian Society for Exercise Physiology
CSS	Canadian Stroke Strategy
CVD	Cardiovascular disease
DPA	Daily Physical Activity
DRI	Dietary Reference Intakes
ESP	Environmental Strategic Plan, City of Edmonton
FAO	Food and Agriculture Organization (of the United Nations)
GFSA	Growing Food Security in Alberta

GST	Goods and Services Tax
HEAL	Healthy Eating and Active Living
HPDIP	Health Promotion, Disease and Injury Prevention division of Alberta Health Services
IHD	Ischemic heart disease
IU	international unit
NAIT	Northern Alberta Institute of Technology
NGO	Non-governmental organization
ONPP	Office of Nutrition Policy and Promotion, Health Canada
PCI	Primary Care Initiative of Alberta
PCN	Primary Care Network
PHAC	Public Health Agency of Canada
PHRED	Ontario Public Health Research and Education Department
REU	Research and Evaluation Unit of AHS HPDIP
RHA	Regional Health Authority
RR	Relative risk
SAIT	Southern Alberta Institute of Technology
TNT	Tracking Nutrition Trends survey
UN	United Nations
WC	Waist Circumference
WCRF	World Cancer Research Fund
WHO	World Health Organization

Executive Summary

Background

Using evidence-based practice and a population health focus, Population Health Innovation and Decision Support (PHIDS) within Alberta Health Services (AHS) is committed to improving the health of Albertan adults (aged 18 years and older), in part, through the prevention of chronic disease. Modifiable lifestyle behaviours, including those related to nutrition, physical activity, and weight management, have demonstrated associations with the development of several major chronic diseases, including cancer, type 2 diabetes, cardiovascular disease, and cerebrovascular disease. Improving these lifestyle behaviours to promote health and reduce the social, physical, and economic burden of these diseases requires targeted, evidence-based strategies and initiatives (World Cancer Research Fund & American Institute for Cancer Research, 2007). PHIDS and its internal and external partners have a unique opportunity to make a positive change in the future health of all Albertans through the development of comprehensive and collaborative strategies targeting known risk factors and high priority population segments.

Purpose and Methods

This situational analysis (SA) is intended to provide a comprehensive overview of the foundational evidence needed to justify chronic disease prevention initiatives, as they relate to nutrition, physical activity, and weight management, for the province of Alberta. This point-in-time (Snapshot) resource can be used by primary care providers, health program planners, policy decision makers and analysts, and others to guide the primary prevention of chronic diseases through individual behaviour change, the implementation of health-promoting public policy, and the mobilization of communities to create environments where healthy choices become easier choices.

This purpose was achieved using multiple methods, which are described further in relevant sections of this report. Briefly, the production of this SA involved:

- Developing the Evidence, Evaluation, Development and Delivery (E2D2) Model for Chronic Disease Prevention Health Interventions as a systematic, evidence-informed approach to designing nutrition, physical activity, and obesity interventions for chronic disease prevention and formed the theoretical basis for completing this SA;
- Summarizing demographic, statistical, and economic indicators related to chronic disease (cancer, type 2 diabetes, and cardiovascular disease), nutrition, physical activity, and weight management for Alberta from a variety of sources, including Statistics Canada's Canadian Community Health Survey (CCHS), the Canadian Council of Food and Nutrition's Tracking Nutrition Trends Survey

(TNT, 2008) and the Alberta Centre for Active Living's 2009 Alberta Survey on Physical Activity;

- Reviewing and synthesizing existing evidence on the linkages between nutrition, physical activity and body weight and the development of cancer, type 2 diabetes, and cardiovascular disease.
- Conducting an environmental scan in order to complete extensive inventories of the structures, policies and services, related to nutrition, physical activity, weight management and chronic disease prevention that are active throughout Alberta and can be utilized to reduce the risk of chronic diseases; and,
- Reviewing and summarizing recommendations and best practices necessary to create effective nutrition, physical activity and weight management initiatives (i.e., programs and services, interventions and resources) focused on the prevention of chronic diseases.

Findings

The Burden of Chronic Disease in Alberta

Chronic diseases, including cancer, type 2 diabetes and cardiovascular diseases, have a substantial impact on population health in Alberta. In 2005, 12,749 Albertans were diagnosed with cancer and 5,332 people died from cancer, with the most common types of cancer being prostate (men), breast (women), lung (both sexes) and colorectal (both sexes) cancers (Alberta Health Services – Alberta Cancer Board, 2008). Six percent of Albertan adults (150,092) were living with diabetes in 2007, with 15,376 newly diagnosed cases and 453 deaths attributable to diabetes during this same year (Alberta Health and Wellness - Surveillance & Environmental Health, 2009). Similar to the incidence and prevalence of diabetes in Alberta, there were an estimated 14,385 new cases of ischemic heart disease (IHD) and 158,635 total cases of IHD in 2008. In 2007, major cardiovascular diseases (heart disease and stroke) accounted for 31% of all deaths in Alberta (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

When direct and indirect costs are considered together, the combined economic burden of cancer, type 2 diabetes and cardiovascular disease in Alberta is substantial. According to the Economic Burden of Illness in Canada, when the economic costs of each disease are added together the total cost for the province was estimated at \$3.15 billion for the year 2000 (\$1.44 billion for cancer, \$234.8 million for type 2 diabetes and \$1.48 billion for cardiovascular disease) (Public Health Agency of Canada (PHAC), in press). These costs listed have been projected to increase over the next 10-20 years (Ohinmaa, Jacobs, Simpson, & Johnson, 2004), providing further support for the primary prevention of these chronic diseases that share common risk factors.

It is clear that these diseases take a considerable toll on population health, the healthcare system, and society as a whole. The evidence reviewed within this

Situational Analysis demonstrates that a healthy diet, regular physical activity and the achievement and maintenance of a healthy body weight have the potential to prevent a significant proportion of the incidence and mortality associated with these chronic diseases. Unfortunately though, this SA also reveals that current health behaviours related to nutrition, physical activity and weight management as well as the policies, programs and structures to support the adoption of such behaviours are less than optimal within Alberta and there are significant opportunities for improving the current situation.

Nutrition and the Prevention of Chronic Disease in Alberta

The relationship between nutritional patterns and the development of chronic diseases is complex; however, the evidence reviewed within this SA reveals that several dietary factors exert a common influence on cancer, type 2 diabetes, and cardiovascular disease risk. Vegetables, fruits, and other foods containing fibre such as pulses and whole grains have a protective effect against several types of cancer, including colorectal cancer and upper gastrointestinal tract cancers, as well as type 2 diabetes and cardiovascular disease (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Excess consumption of red and processed meat is associated with an increased risk of colorectal cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007), while high intakes of saturated fat, accompanied by relatively low intakes of unsaturated fats, are associated with increased risks of type 2 diabetes and cardiovascular disease (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Salty foods and high sodium intakes, have demonstrated linkages to the development of stomach cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007), as well as hypertension, cardiovascular disease and stroke (Institute of Medicine (U.S.). Panel on Dietary Reference Intakes for Electrolytes and Water, 2004).

Although dietary habits have a direct influence on chronic disease risk, the statistical indicators reviewed here, suggest that the nutrition-related behaviours of many Albertans are not conducive to chronic disease prevention. Data from the 2007 Canadian Community Health Survey (CCHS, Cycle 4.1) reveals that over half of Albertan adults consume less than 5 daily servings of fruit and vegetables per day (55.6%)(Statistics Canada, 2008a), with more men failing to meet this daily minimum than women (64% of men versus 48% of women). Accessibility and affordability of fruits and vegetables may be an issue in the former Palliser and Northern Lights Health Regions, where over 60% of adults consumed fewer than 5 servings per day. Fruit and vegetable intake is a widely-used indicator of overall diet quality, however, additional evidence from the 2004 CCHS (Cycle 2.2) which included a detailed nutritional assessment, provides more information about the dietary habits of Albertans. During this year, 96.6% of men and 65.9% of women exceeded the recommended daily maximum for sodium (salt) consumption and, on average, Albertan adults did not consume enough fibre to prevent against chronic

disease(Statistics Canada, 2004a). Additionally, over 25% of Albertan adults obtained more than 10% of their daily calories from saturated fat, which likely contributes to increased risks of cardiovascular disease and type 2 diabetes (Statistics Canada, 2004a).

More detail on the associations between dietary components and each chronic disease, and on relevant statistical indicators can be found in Chapters 3 and 4; however, it is clear that there are substantial opportunities for improvement in the dietary habits of Albertans.

Physical Activity and the Prevention of Chronic Disease in Alberta

Regular physical activity is convincingly associated with a reduced risk of type 2 diabetes, cardiovascular disease and several of the major types of cancer in Alberta, including breast and colorectal cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Furthermore, in 2001, physical inactivity was estimated to account for 2.6% of total health care costs in Canada, which represents \$5.3 billion (1.6% billion in direct costs and \$3.7 billion in indirect costs) (P. T. Katzmarzyk & Janssen, 2004). It was also estimated that a 10% decrease in the prevalence of physical inactivity in Canada, through an increase of 30 minutes of moderate to vigorous activity 4 days a week, has the potential to reduce direct health expenditures by \$150 million per year (P. T. Katzmarzyk, Gledhill, & Shephard, 2000).

Physical inactivity is burdensome, both economically and in terms of its influence on chronic disease risk, and nearly half of Albertans (46.6%) reported being inactive during their leisure time in 2007(Statistics Canada, 2008a). While the prevalence of physical inactivity was nearly equal among men and women, it increased with age with 40% of individuals aged 18 to 24 years being inactive and 58% of individuals aged 75 years and older being inactive. Furthermore, rates of physical inactivity decreased with increasing household income level and education level, as the highest levels of inactivity were observed among Albertans with the least amount of education and lower income levels (Statistics Canada, 2008a). These observations suggest a need for targeted solutions to address the underlying determinants of health that influence individual behaviours.

Weight Management and the Prevention of Chronic Disease in Alberta

Excess body weight (measured using body mass index or waist circumference) increases the risk of type 2 diabetes, cardiovascular disease, esophageal, pancreatic, colorectal, postmenopausal breast, endometrial and kidney cancers, and gallbladder cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO)

of the United Nations, 2003). In 2005, the direct and indirect costs of overweight and obesity in Alberta were estimated to be over \$1.2 billion, when direct health care costs, indirect short and long-term disability costs, and premature mortality costs attributable to overweight and obesity were combined (Alberta Health Services Cancer Prevention Program & GPI Atlantic, 2009). The highest costs attributable to overweight and obesity were those incurred as a result of coronary heart disease (\$299.4 million), type 2 diabetes (\$154.0 million), hypertension (\$121.8 million), and cancer (\$111.6 million).

In 2004, which was the last time measured height and weight data was collected in Canada at the time of this writing, over 60% of Albertan adults were either overweight or obese (60.9%). Men had significantly higher rates of obesity and overweight than women (68.8% among men versus 52.8% among women), and the prevalence of excess weight in the population increases with age. The lowest rates of overweight and obesity were found in the former health regions containing large urban centers (Calgary, Edmonton, Red Deer, Lethbridge), while higher rates of excess weight existed in more rural former health regions (Statistics Canada, 2008a). Future obesity control interventions are needed to target men and rural populations as priority groups and to prevent or reduce the gradual weight gain that occurs in early and middle adulthood.

Structures, Policies and Services related to Nutrition, Physical Activity and Weight Management in Alberta

Organizational, programmatic and service-based approaches to chronic disease prevention should be evidence-based, flexible and include a strategic mix of possible actions. An environmental scan identified organizations, programs and activities in various sectors - government (national, provincial, regional and municipal), non-government (NGO), and private - using relevant resources and methods of inquiry. Existing national and provincial databases, online information, and content from qualitative interviews conducted with key informants and stakeholders were examined.

Currently, it is estimated that over 99 organizations and 116 programs, targeting adults (18 years of age or older), are operating in Alberta. These organizations are capable of offering direct programming, capacity building initiatives and knowledge exchange support services specific to nutrition and physical activity in Alberta. Most organizations have objectives, activities and mandates that align with Alberta Health Services' goals of targeting nutrition, physical activity and weight management to reduce disease incidence, mortality and burden.

In contrast, an assessment of nutrition and physical activity policy work at the provincial level revealed that while Alberta offers its residents tax credits and incentives for physical activity, it has no formal legislation or policies currently in place concerning: tax credits and incentives for nutrition and healthy eating; food

labeling legislation; or food safety legislation amendments. Alberta also lacks a provincial healthy eating and physical activity strategy, respectively.

In addition to the organization, program and policy inventory (noted above, and explored further in Chapters 5 and 6), an environmental scan of 129 Alberta municipalities, including 16 cities, 109 towns and 4 specialized municipalities was conducted. Within each municipality, existing programs, policies and infrastructure aimed at engaging citizens in healthy eating, being physically active and living healthier lifestyles were identified. Overall, the municipal scan resulted in 5,477 identified program and policy components, which were organized into five areas of interest, including:

Parks and Recreation Infrastructure and Programming (*n=4,676 [85%]*);
Transportation Strategies (*n=261 [5%]*);
Community Safety Initiatives (*n=144 [3%]*);
Food and Nutrition Initiatives (*n=140 [3%]*); and,
Healthy Living and Health Promotion Strategies (*n=256 [5%]*).

Recommendations

In 2005, 8,571 of the 19,288 deaths (44% of total mortality) that occurred in Alberta were attributed to diabetes mellitus, major cardiovascular diseases (including cerebrovascular disease), or cancers that are convincingly associated with poor nutrition, physical inactivity, and overweight and obesity (Statistics Canada, 2009). This estimate does not include deaths from diseases that have probable associations with these modifiable risk factors. Without effective preventive interventions, the burden of cancer, type 2 diabetes, and cardiovascular disease will continue to rise in Alberta. A comprehensive chronic disease prevention strategy that supports nutritious dietary habits, regular physical activity, and the management of a healthy body weight (common health behaviours that help to prevent all three diseases), is required to ensure that the population remains healthy throughout the life course, especially midlife and later adulthood.

Maximizing chronic disease reduction efforts to create the largest possible region of reward and, ideally, to reduce rates of incidence and mortality, requires a strategy to prevent, manage and cure chronic diseases. Taking an inclusive, integrated and comprehensive approach, the essential components of this strategy are: prevention, early detection and screening within sub-groups at higher risk of chronic disease, treatment, palliative and rehabilitative care, and policy and advocacy. Focused research is vital to achieve and inform these components. Given its focus on primary prevention of chronic diseases, this Situational Analysis provides evidence-based recommendations for individual-level behaviours, programs, interventions and policies related to nutrition, physical activity and weight management. More specifically, groups within and in partnership with

Alberta Health Services should create functional partnerships and working groups to accomplish a number of recommendations for action, which include:

- The creation of new baseline measures and indicators to coincide with the surveillance and monitoring of existing targets for chronic disease prevention.
- The establishment of a central body (group, collective or organization) to independently collect innovative health data and provide to access to data from external sources.
- Conducting more foundational and applied research to examines the key target populations of AHS and its partners, which include but are not limited to:
 - Rural Albertans, in particular residents of AHS' newly established North, Central and South zones;
 - First Nations Populations;
 - Young Adults, in particular those between 18 and 35 years of age.
- The application of robust and critically reviewed evidence within the development, implementation and evaluation of disease prevention outputs - programs, policies and practices.
- The completion of a comprehensive review of policy alternatives intended to improve dietary habits, activity levels and rates of overweight and obesity in the population
- The establishment of a cross-sectoral organization capable of working collaboratively and dedicating sustained time and resources to reduce chronic disease through primary prevention.
- The development, implementation and evaluation of an evidence-based provincial workplace program intended to improve the nutrition, physical activity, and weight-related behaviours of Albertan adults.
- The creation of comprehensive, long-term strategy for obesity prevention and reduction in the province of Alberta.
- Improved municipal and community engagement for disease prevention through fostering both new and established functional partnerships.

Alberta Health Services' Population Health portfolio is committed to providing leadership and coordination across the province for enhanced capacity, partnerships and community development that will help Albertans increase and maintain their uptake of healthy eating and regular physical activity. Given the new AHS organizational structure and the critical role of nutrition in the prevention of chronic diseases, a strategy for ongoing collaboration between Population Health Innovation and Decision Support (AHS), Health Promotion Disease and Injury Prevention (HPDIP) and Nutrition & Food Services Population and Public Health is necessary. Such a partnership will facilitate the joint creation of strategic

documents, as well as the planning and development of Alberta-wide strategies and initiatives related to nutrition.

In the future, more community and provincial level data are needed to continue monitoring and surveillance of the most prevalent risk factors and modifiable health behaviours related to chronic diseases.

This Situational Analysis, which is intended to be used as a guide for future programming and policy work, found that while a great deal of work in the areas of nutrition, physical activity and weight management is currently being performed, the relevant health behaviours of Albertans need to improve. An examination of current health perceptions, behaviours and body weight statuses in Alberta provides a starting point for creating feasible individual and population-level recommendations and goals for nutrition, physical activity, and body weight that will effectively contribute to reduced incidence and mortality of chronic disease in the future. Supportive programmatic and policy structures that leverage current national, provincial, regional and municipal strengths and assets are needed to ensure that the Alberta environment supports the adoption of individual-level behaviours related to nutrition, physical activity and weight management.

Chapter 1: Introduction

Key Points

- A Situational Analysis is a resource that can inform the planning of primary prevention programs that address population-level behavioural changes, the implementation of health-promoting public policy, and the mobilization of communities to create environments where healthy choices are accessible, sustainable and of the highest quality.
- This SA outlines prevalence of chronic diseases in Alberta, provides a thorough examination of the associations between specific diseases and nutrition, physical activity and weight management risk factors and health behaviours, and presents effective health promotion strategies and best practices for primary prevention at the population level.
- The Evidence, Evaluation, Development, and Delivery (E2D2) model for Chronic Disease Prevention Health Interventions was developed and adapted from existing health promotion, social-ecological, environmental, and economic models and frameworks.
- Within this SA, the E2D2 Model was used to guide the incorporation of relevant and evolving evidence related to nutrition, physical activity, weight management, and chronic disease prevention in the Alberta context.

“The scale and pattern of disease reflect the way that people live and their social, economic, and environmental circumstances, and all of these can change quickly.”

Geoffrey Rose, The Strategy of Preventive Medicine
(Rose, Khaw, & Marmot, 2008)

Background

Alberta Health Services is committed to reducing the incidence and mortality rates of chronic diseases related to nutrition, physical activity and weight management. Behaviours related to nutrition, physical activity and weight management have demonstrated linkages to the risk of specific chronic diseases, including cardiovascular diseases, type 2 diabetes and multiple types of cancer, and addressing these behaviours requires targeted, evidence-based strategies and initiatives (World Cancer Research Fund & American Institute for Cancer Research, 2007). The primary prevention of chronic diseases focuses on minimizing risk factors that are known to increase disease risk and maximizing the prevalence of health behaviours that are associated with a decreased disease risk. Current evidence suggests that:

- At least half of all new cancers are due to preventable factors and that prevention offers the most cost-effective, long-term strategy for the control of cancer (Canadian Cancer Society (CCS) & National Cancer Institute of Canada (NCIC), 2009);
- One-third of all global deaths can be attributed to cardiovascular disease (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003); and,
- The prevalence of type 2 diabetes, currently estimated at 150 million worldwide, is predicted to double by 2025 (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Most chronic diseases are preventable, and to reduce disease risk and avert increases in disease incidence and related mortality in the future, the health of Albertans must be improved in the present. What this entails are integrated, collectively designed and implemented efforts from a variety of groups including health professionals (at all levels, in all disciplines), politicians and policy-makers, and Alberta’s population at-large. In essence, these efforts must move beyond traditional health care fundamentals and incorporate a consideration of factors and determinants of health not only related to human biology and lifestyle, but social and physical environments as well. For successful disease prevention, it is necessary to establish a unified vision that links local regional, provincial and national organizations and initiatives to more effectively build strengths and fill gaps.

Accordingly, essential prerequisites for the prevention of disease include the:

- Use of evidence-based, population health approaches for chronic disease prevention to improve the health of Albertan adults through a reduction in the prevalence of modifiable lifestyle risk factors that are linked to the development of specific chronic diseases¹;
- Development of comprehensive collaborative strategies that concentrate on known risk factors and differences in health status not just among individuals, but among well-defined groups, populations and sub-populations;
- Implementation of strategies that link partners from regional, national and international communities and sectors levels to make a difference in causal factors and social structures, including income, education, racial and ethnic status, amongst others, that inherently affect the lives of individuals; and,
- Participation of all relevant parties and key stakeholders to facilitate and sustain necessary social, environmental, interpersonal and individual changes, to create supportive contexts where healthy choices are the easiest choices.

Across the province, efforts to help Albertans reduce their chronic disease risk have been fragmented and unfocused. Currently, there are significant gaps that need to be filled. A great deal of research is still required to gather and synthesize evidence to inform practices, programs and policies. In turn, many of the initiatives that should apply research findings also need to capitalize on past efforts, existing partnerships and funding opportunities to create new and innovative disease-prevention strategies and protocols.

Alberta Health Services' Population Health portfolio employs a population-based approach within a chronic disease control model, thus shifting from a purely patient-centered approach to a comprehensive, population health management approach using a variety of individual, organizational and systemic interventions. As a first step in supporting this approach, AHS Population Health Innovation and Decision Support Division (PHIDS) has conducted this Situational Analysis (SA).

A Situational Analysis is a resource intended to inform the planning of primary prevention programs that address population-level behavioural changes, the implementation of health-promoting public policy, and the mobilization of communities to create environments where healthy choices are accessible,

¹ While the focus of this Situational Analysis is the reduction of chronic disease risk among Albertan adults, the authors recognize the importance of implementing evidence-based nutrition, physical activity and weight management interventions for multiple age groups, including children and youth, at both the provincial and community level. An examination of "upstream" preventative programming related to nutrition, physical activity, and weight management directed at children and youth will likely be conducted by PHIDS to support HPDIP in 2010-2011.

sustainable and of the highest quality. This SA, in particular, outlines the prevalence of chronic diseases in Alberta, provides a thorough examination of the associations between specific diseases and nutrition, physical activity and weight management, and presents effective health promotion strategies and best practices for primary prevention at the population level.

The E2D2 Model for Chronic Disease Prevention Health Interventions

To guide the planning, implementation and evaluation of initiatives within AHS Population Health, several empirically-validated health promotion, social-ecological, environmental and economic models and frameworks were reviewed to identify a strategic framework that would address the complex interrelationships between chronic disease and nutrition, physical activity, and weight management risk factors within the Alberta context².

Each model was assessed for its ability (i) to be fluid; (ii) to incorporate emerging evidence throughout the program development process; (iii) to address physical, social, and environmental influences; and (iv) to determine the potential of existing policies, services and structures to be directly applicable in the disease prevention context.

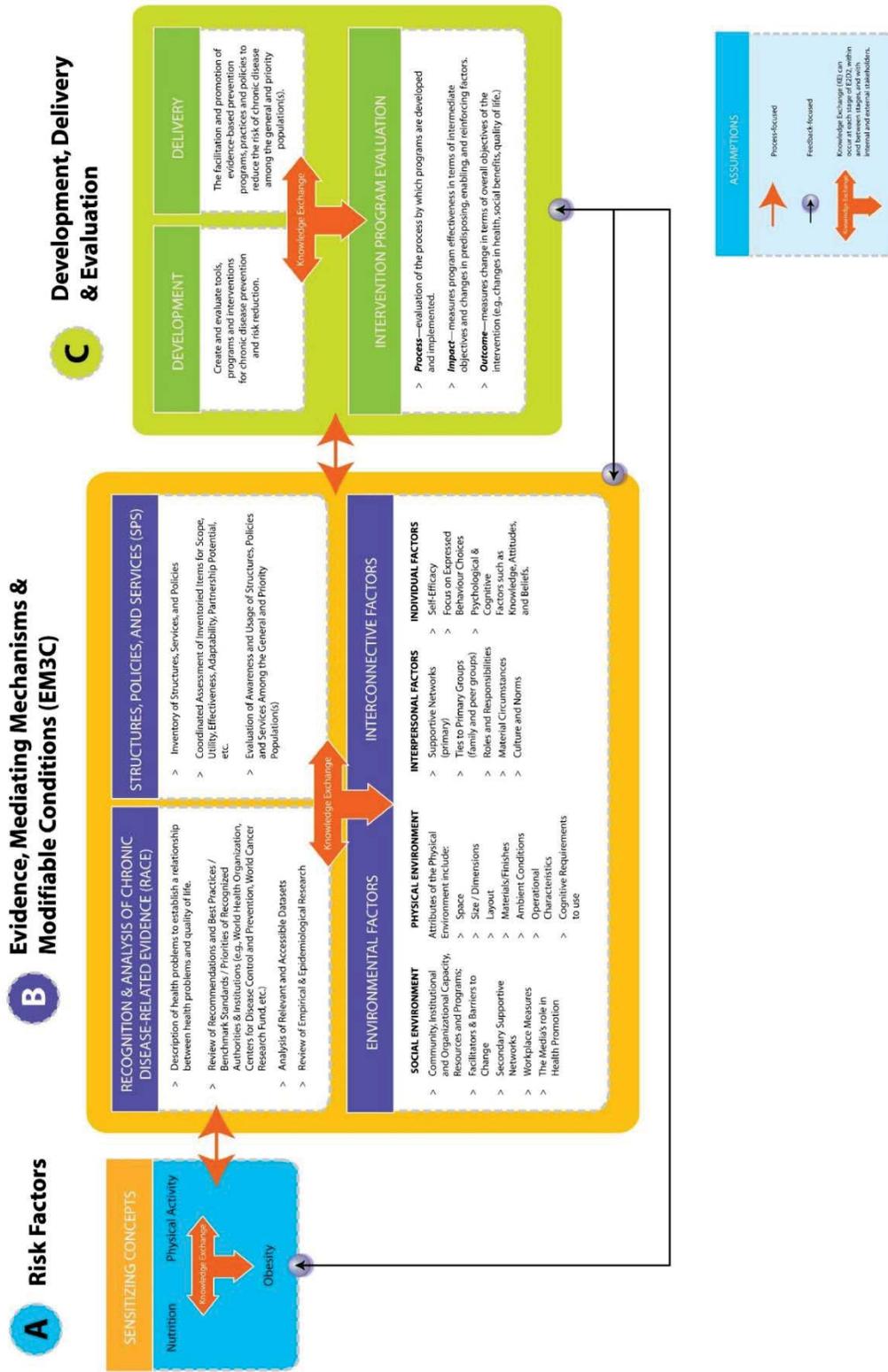
However, none of the existing models were able to be utilized as a standardized framework to address behavior change as it relates to cancer, to the extent that:

- Positive changes could be made at multiple levels (i.e., the individual, community, and society); and,
- Evidence could be continually incorporated within an ever-evolving body of knowledge to further the impact and success of programmatic efforts.

As a result, validated and complementary components of existing theoretical and practical frameworks were combined into an omnibus model, to allow for the incorporation of relevant and evolving chronic disease-related evidence into the development, delivery and evaluation of prevention-centered programs addressing nutrition, physical activity and obesity. The result of these efforts is the Evidence, Evaluation, Development and Delivery (E2D2) model for Chronic Disease Prevention Health Interventions ([Figure 1.1](#))

² The models that were reviewed included PRECEDE-PROCEED model, the Social Ecological Model, the Transtheoretical (Stages of Change) Model, the Population Health Promotion (PHP) model, the Social Cognitive Model, the Harvard Cancer Prevention Project, the ANGELO framework, the WHO Global Strategy on Diet, Physical Activity and Health (DPAS), and the Swiss Model for Outcome Classification in Health Promotion and Prevention (SMOC).

Figure 1.1 – The E2D2 Model for Chronic Disease Prevention Health Interventions



The E2D2 model was reviewed and approved by a group of accredited interventionists and international experts in relevant fields. It summarizes a systematic, evidence-informed approach to designing nutrition, physical activity, and obesity interventions focused on chronic disease prevention, with potential applications to other components of the Albertan healthcare system. The term E2D2 reflects the four pillars upon which the model is based: Evidence, Evaluation, Development and Delivery.

The model is designed to transition through three process- and feedback-oriented phases:

- A. Sensitizing Concepts;
- B. Evidence, Mediating Mechanisms and Modifiable Contexts (EM3C); and,
- C. Development, Delivery and Evaluation.

Phase A - Sensitizing Concepts

Sensitizing concepts are ideas and terms that can be used by health professionals for a 'general sense of reference and guidance' in addressing health concerns and disparities (Blumer, 1954). Nutrition, physical activity, and obesity are sensitized in the E2D2 model as health behaviours that have a demonstrated risk associated with specific chronic diseases. For example, it has been confirmed that a healthy diet, regular physical activity and a healthy body weight have the potential to prevent 30-40% of all cancers (World Cancer Research Fund & American Institute for Cancer Research, 2007). By comparison, the same behaviours have the potential to reduce the risk of heart attacks in the population by 40% (Public Health Agency of Canada, 2009)³. Alberta-specific evidence for nutrition and physical activity helps to contextualize the E2D2 model by reinforcing the need for Albertans to improve their health behaviours and reduce their related risk of chronic disease over time.

Phase B - Evidence, Mediating Mechanisms and Modifiable Contexts (EM3C)

The second phase and the holistic core of the E2D2 model is EM3C, which is comprised of three interrelated, systematic components:

- Recognition and Analysis of Chronic disease-related Evidence (RACE), which entails a review and synthesis of existing evidence – standardized, epidemiological and empirically-based – and research. This review can either precede or be conducted simultaneously with the second component;

³ If smoking and tobacco use is not included in the calculation of reduced risk, then the reduction would be 79%.

- Structures, Policies and Services (SPS), which is an environmental scan or inventory of structures, policies and services that are topic-specific and can be utilized, through partnership and modeling opportunities, to reduce the risk of chronic disease;
- The identification and review of factors, modifiable conditions, and proximal determinants, categorized as environmental (social and physical environment) or interconnective (interpersonal and individual) factors, which can influence overall and behaviour-specific chronic disease risk.

Phase C - Development, Delivery and Evaluation (DDE)

The third phase of the E2D2 model begins with the development of nutrition, physical activity, and weight management programs, interventions, services, and other evidence-based resources focused on the prevention of chronic disease. The delivery of these measures is then based on the facilitation and promotion of prevention practices and policies that display good fit and reach within Alberta. Interventions and programs are evaluated according to:

- The process by which they are designed and implemented;
- Their impact on the environment (both social and physical) and the interconnected conditions (interpersonal and individual) that influence health behaviour; and,
- Their ability to meet overall objectives, achieve desired outcomes, and demonstrate improvements to health-status indicators.

All three phases of the E2D2 model are presented in this Situational Analysis.

- Chapter 2 provides an overview of the Sensitizing Concepts – demographics, economic costs, and facts about chronic disease prevalence, incidence and related mortality - that are related to nutrition, physical activity and weight management risk factors.
- Chapters 3 and 4 offer the Recognition and Analysis of Chronic disease-related Evidence (RACE) with a comprehensive synthesis and review of existing evidence on the linkages between disease risk and nutrition, physical activity and weight management health behaviours; and, analysis and interpretation of relevant and accessible data sources.
- Chapters 5 and 6 inventories the Structures, Policies and Services (SPS) that are active throughout Alberta and can be utilized to reduce chronic disease risk, while simultaneously reviewing the factors, modifiable conditions, and proximal determinants which can influence overall and behaviour-specific disease risk.

- Lastly, Chapter 7 examines the Development, Delivery and Evaluation (DDE) of recommendations and best practices necessary to create effective nutrition, physical activity and weight management initiatives (i.e., programs and services, interventions and resources) focused on the prevention of relevant chronic diseases.

Chapter 2: Sensitizing Concepts

Key Points

- The already-substantial burden of cancer, type 2 diabetes, and cardiovascular disease has been projected to increase if effective preventive measures are not taken.
- In 2006, 13,541 Albertans were diagnosed with cancer and 5,477 people died from cancer. Prostate cancer (men), breast cancer (women), lung cancer (both sexes), and colorectal cancer (both sexes) combined to account for 55% of new cancer cases and 49% of cancer-related deaths in Alberta during 2006.
- In 2007, 15,376 Albertan adults were diagnosed with diabetes and a total of 150,092 Albertans were living with diabetes. While the mortality associated with diabetes is relatively low compared to that associated with cancer and cardiovascular disease, diabetes is associated with multiple co-morbidities including cardiovascular disease, lower limb amputations, end-stage renal disease, poor eye health, and mental illness.
- Ischemic heart disease affected 158,635 Albertans during 2008, with 59% of these cases existing among males. Diseases of the circulatory system accounted for 31.1% of all deaths in Alberta during 2007.
- The combined economic burden of cancer, diabetes, and cardiovascular disease in Alberta is considerable. In the year 2000, the direct and indirect costs associated with these diseases was estimated at \$3.15 billion.

Introduction

Alberta Health Services (AHS) works to promote the up-take and maintenance of healthy behaviours that have demonstrated chronic disease risk-reducing effects. At the population level, this work targets specific groups of people who, based on their demographic characteristics and related health behaviours, are at risk of developing specific chronic diseases that will inherently affect their quality of life (Alberta Cancer Board & Alberta Cancer Foundation, 2008).

The aim of this chapter is to emphasize why the chronic diseases of interest here - cancer, type 2 diabetes and cardiovascular and cerebrovascular disease – need to be prevented. These diseases were chosen because of the substantial health impact they have on the population aged 18-65 years. The Public Health Innovation and Decision Support division of AHS (PHIDS) recognizes that osteoporosis and its outcomes (e.g. bone fractures) have also been associated with modifiable behaviours related to nutrition and physical activity, however, this disease has been excluded from the current situational analysis because its health effects are seen mainly in older adults, and this is also the time (with childhood and adolescence) when preventive measures have demonstrated effectiveness (Kruk, 2007; Lanham-New, 2008; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Osteoporosis, and other diseases of late adulthood, may be the topic of future research completed by PHIDS.

This chapter is intended to increase understanding of how to maximize the impact of disease prevention efforts across the province, its components include:

- Introductions to the key sensitizing concepts for this Situational Analysis: cancer, type 2 diabetes, and cardiovascular disease;
- An overview of the incidence, prevalence and related mortality of each disease;
- An examination of the economic burden of disease, as well as the economic costs associated with poor nutrition, physical activity and obesity, incurred by the province of Alberta, both current and projected, where evidence is available; and,
- A brief review of the non-modifiable and modifiable risk factors for each disease and the impact of such factors within Alberta.

An Introduction to Cancer

According to the World Health Organization (WHO), the term ‘cancer’ encompasses a group of diseases that can affect any part of the body (World Health Organization (WHO), 2009). Using medical terminology, cancer commonly refers to malignant tumours and neoplasms. By definition, malignant tumours will infiltrate adjacent tissues to gain access to further blood supplies to aid their growth. If left untreated, these malignancies will break away, spread throughout the body (a process known as metastasis), and ultimately lead to death (World Health Organization (WHO), 2009). Cancers develop due to genetic damage, which may happen randomly or as a result of exposure to carcinogens (also known as cancer-causing agents). Different cancers may arise as the result of the interaction between a person's genetic factors and three categories of external carcinogenic agents, including (World Health Organization (WHO), 2009):

- Physical carcinogens, such as ultraviolet and ionizing radiation
- Chemical carcinogens, such as asbestos, components of tobacco smoke, aflatoxin (a food contaminant) and arsenic (a drinking water contaminant)
- Biological carcinogens, such as infections from certain viruses, bacteria or parasites.

Depending on their cell growth and behaviour, cancerous tumours can be benign, in situ, or invasive. The difference between each is provided as follows (National Cancer Institute (NCI), 2006):

- **Benign tumour** cells have mutations but appear very similar to the cells from which they originated. The tumour itself is generally encapsulated and can be removed relatively easily. Benign tumours are rarely fatal except for those arising within the central nervous system, which can cause fatal compressions of the brain.
- **In situ tumours** are localized; even though they contain malignant cells, those cells are confined to the site of origin without invading the organ. As such, the localized tumour can usually be removed easily without the need for further treatment. However, if left untreated an in situ tumour will invade the local organ and become an invasive tumour. For that reason, in situ tumours are considered to be pre-invasive tumours.
- **Invasive malignant tumours** will infiltrate adjacent tissues to gain access to further blood supplies to aid growth. If left untreated they will break away and spread through out the body, known as metastasis, ultimately leading to death.

Cancer can be reduced and controlled by implementing evidence-based strategies for cancer prevention, as well as early detection of cancer and the management of patients with cancer. As will be examined further, the combination of a healthy diet and regular physical activity and an appropriate body weight has the potential to prevent 30% to 40% of cancers (World Cancer Research Fund & American Institute for Cancer Research, 2007).

An Introduction to Diabetes

Diabetes mellitus (DM) is a disorder that results from the body's inability to sufficiently produce and/or properly use insulin (Public Health Agency of Canada, 2005). Insulin, a hormone released by the pancreas, allows cells in the body to use glucose (sugar) in the blood as an energy source. The three most commonly recognized types of diabetes are (Public Health Agency of Canada, 2005):

- **Type 1 Diabetes:** An autoimmune disorder that typically develops in childhood or adolescence and is characterized by inadequate production of insulin by the pancreas;
- **Type 2 Diabetes:** A metabolic disorder that typically develops in individuals aged 40 years and older and occurs when the pancreas does not produce enough insulin to meet the body's needs and/or when the body's cells become less responsive to insulin (insulin resistance); and,
- **Gestational Diabetes:** A form of diabetes that develops during pregnancy due to insulin deficiency (a woman's insulin needs during pregnancy increase by 2-3 times their normal level).

Type 1 diabetes is generally diagnosed in childhood or adolescence and accounts for approximately 5-10% of all diabetes cases (Johnson, Vermeulen, & Hugel, 2007). Research to date has yet to identify modifiable risk factors for type 1 diabetes. Gestational diabetes is transient in nature as it affects pregnant women temporarily, and it will be highlighted as a risk factor for the later development of type 2 diabetes within this document. In contrast, type 2 diabetes is usually associated with onset after 30-40 years of age, and accounts for 90-95% of all diabetes cases. As subsequent sections will reveal, a considerable proportion of type 2 diabetes can be prevented through a healthy lifestyle.

An Introduction to Cardiovascular Disease

Cardiovascular diseases (CVD) are impairments of the heart and circulatory system that involve the heart or blood vessels (arteries and veins). In practice, cardiovascular diseases are treatable and, in some cases, reversible with treatment primarily focused on nutrition, physical activity and weight management health behaviours.

Cardiovascular diseases, or CVDs, are typically grouped into four classifications (Public Health Agency of Canada, 2009):

- **Ischemic Heart Disease (IHD)**, a condition where the heart muscle is damaged or works inefficiently due to a reduced or absent blood supply. IHD, which is also known as coronary heart disease or coronary artery disease, is caused by any combination of genetics, increases in age, smoking habits, dietary fat intake, dyslipidemia (a disruption in the amount of lipids, which include naturally occurring fats, waxes, sterols, and fat-soluble vitamins such as vitamins A, D, E and K, in the blood), diabetes and hypertension (or high blood pressure), amongst other factors⁴;
- **Myocardial infarction**, commonly known as a heart attack, where the blood supply to the heart is interrupted long enough to cause damage;
- **Congestive Heart Failure (CHF)**, is a condition in which the heart cannot work as 'efficiently' as it should and pump enough blood to other organs. As a result, the circulation of blood throughout the body 'backs up' causing congestion in the tissues; the tissues start to swell (edema) and 'build up fluid' particularly in the lungs or legs; and,
- **Cerebrovascular diseases**, which include any disease or impairment of one or more blood vessels of the brain, or blood vessels leading up to the brain, that can result in neurological damage. Depending on the type of impairment, these diseases can be classified into three major types:
 - **Ischemic Stroke** or impaired blood flow from the carotid arteries to the brain;
 - **Intracerebral Brain Haemorrhages** or bleeding of the brain; and,
 - **Atraumatic Subarachnoid Haemorrhage** or an aneurysm at the base of the brain.

⁴ It is suggested that at least 50% of the risk of IHD is related to genetic predisposition or a strong family history of other forms of CVD. In combination with unhealthy behaviours and an unhealthy environment, this risk is likely to be even higher.

The effects of a cerebrovascular event depend on where the brain was injured and how much damage was incurred. Common after-effects include impairments in a person's mobility, memory, understanding, speech, and other motor functions. Considered together as vascular diseases, a conservative estimate is that 1.6 million (5%) Canadians have heart disease or are currently living with the effects of a stroke (Public Health Agency of Canada, 2009).

Prevalence, Incidence and Mortality of Chronic Disease in Alberta

The prevalence of a disease is defined as the total number (or percentage) of cases of a disease in the population at a given time. By comparison, the incidence of a disease reflects the number of new cases which are identified in a given time period in the population at risk. Incidence conveys information about the risk of developing the disease, whereas prevalence indicates how common the disease is in terms of existing cases. Mortality is a measure of the number of deaths (in general, or due to a specific cause) in the population.

Depending on the data source, incidence and mortality can be expressed in three ways, as a(n):

- Crude rate or units of new cases or deaths per 1,000 (or 100,000, 1 million, etc.) individuals per year;
- Age-adjusted or age-standardized rate which adjusts the rate (or number of new cases or deaths) to account for differences in the population's age composition in different regions or at different times; and,
- Age-sex specific rate which measures the total number of new cases or deaths per year for people of a specific age or age group.

Cancer

Cancer incidence and mortality statistics have been collected in Alberta since 1942, thereby permitting provincial rates to be estimated over time and future trends to be projected. Data from the Alberta Cancer Registry, in association with the Canadian Council of Cancer Registries, the National Cancer Institute of Canada, and the Health Statistics division of Statistics Canada, provides detailed information regarding incidence and mortality of the most common types of cancer by age and gender. Incidence counts are based on the diagnosis and classification of new cancer cases per year (Alberta Health Services – Cancer Care, 2009)⁵. Mortality counts are based on the number of deaths attributed to

⁵ Benign or non-malignant tumours and carcinomas in situ (CIS), also known as pre-cancer, are excluded from all incidence counts.

a particular type of cancer per year (Alberta Health Services – Cancer Care, 2009).

2006 Incidence and Mortality Statistics

In 2006, 13,541 Albertans were diagnosed with cancer and 5,477 people died from cancer. Lung cancer was the leading cause of death due to cancer, for both men and women in 2006, and is estimated to be the leading cause of cancer-related death in 2009 (Canadian Cancer Society (CCS) & National Cancer Institute of Canada (NCIC), 2009). The most common cancers in Alberta in 2006 were prostate (men), breast (women), lung (both sexes) and colorectal (both sexes) cancer. These four cancers accounted for 55% of new cancer cases and 49% of cancer-related deaths (Alberta Health Services – Cancer Care, 2009). Breast, colorectal and lung cancer also have associations with nutrition, physical activity and weight management behaviours, while prostate cancer is only associated with nutrition behaviours (examined in further detail in Chapter 3).

Projections for Cancer Incidence and Mortality

Long-term trends in cancer incidence, mortality and overall population growth between 1992 and 2005, were used to estimate the number of new cancer cases and related-deaths in Alberta for 2009 (Canadian Cancer Society (CCS) & National Cancer Institute of Canada (NCIC), 2008). Overall, an estimated 15,700 new cases of cancer and 6,100 deaths from cancer are likely to occur in Alberta in 2009. The rates of incidence and mortality for men are expected to outnumber those for women (8,500 to 7,300; 3,200 to 2,900), respectively. Age-specific projections are more difficult to ascertain due to smaller sample sizes and the greater potential for statistical variations to occur over time among different age groups.

The Importance of a Comprehensive Cancer Control Strategy

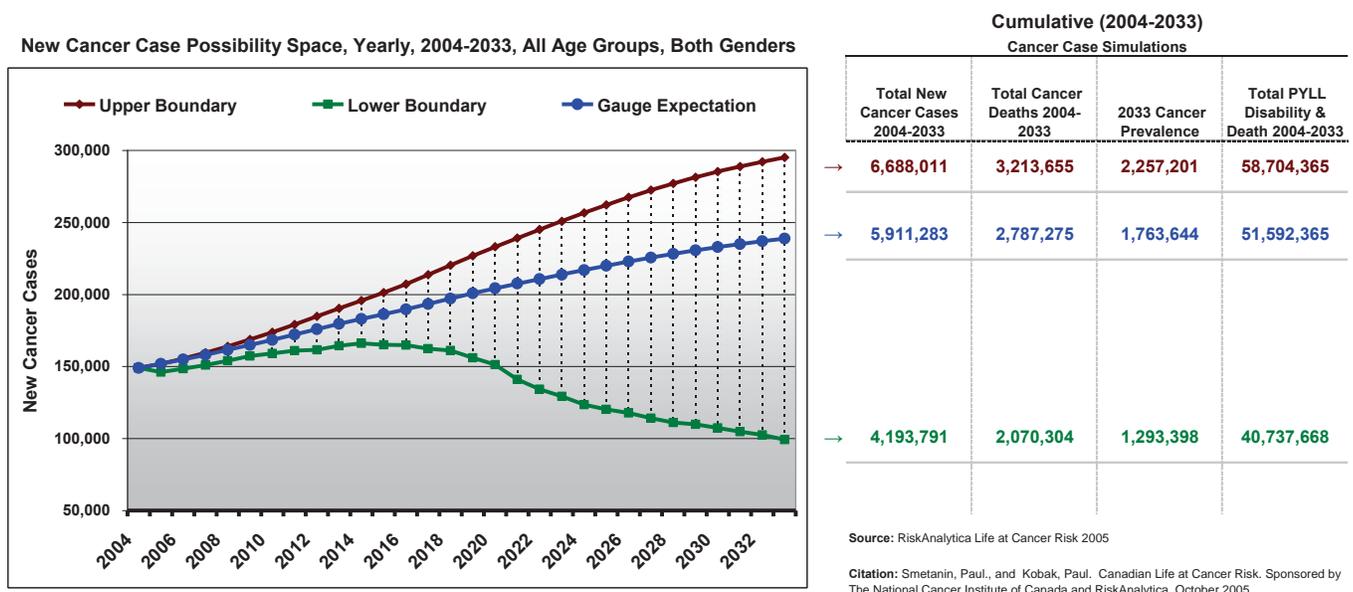
With rates of cancer incidence and mortality expected to increase continually both at a provincial and national level over time, a cancer control strategy is required that can target and maximize cancer prevention efforts and minimize the impact of the expected rate increases. Maximizing our cancer reduction efforts to create the largest possible region of reward, ideally leading to reduced rates of incidence and mortality, entails a cancer control strategy that seeks to prevent, care for and cure cancer. Taking an inclusive, integrated and comprehensive approach, the essential components of this strategy are: prevention, early detection and screening, treatment, palliative and recovery care, and policy and advocacy. Targeted research is vital to achieve and inform these components.

From a risk management perspective, effective cancer control is a continuous management action that requires:

- An understanding of the possible causal pathways of cancer increases and reduction;
- Sufficient communication and knowledge exchange between different areas of cancer research (prevention, clinical research, epidemiology, etc.); and,
- A performance evaluation and monitoring of resource utilization.

Figure 2.1 (below) demonstrates the potential impact of an effective cancer control strategy on the development of new cancers. Using recent national-level incidence data in combination with a cancer state transition model and a macro-economic model to jointly simulate the wider spectrum of impacts due to cancer, RiskAnalytica, a risk management firm based in Ontario, estimated that between 2004 and 2033, nearly six million new cancer cases (5,911,823) are expected to occur across Canada when various factors, such as tobacco use, nutrition and physical activity are controlled (Smetanin & Kobak, 2005). Without an effective cancer control strategy, this estimate could potentially be as high 6.7 million new cases, with 3.2 million cancer related deaths (Smetanin & Kobak, 2005). The difference between these estimates is considered to be the region of risk. In contrast, with an effective cancer control strategy that incorporates the components listed above, it is estimated that the number of new cases over the 30 years could be as low as nearly 4 million (4,193,791) (Smetanin & Kobak, 2005). The difference between this set of estimates is called the region of reward and it highlights the potential effectiveness of work in the cancer control field.

Figure 2.1 – New Cancer Cases Possibility Space, Yearly, 2004-2033. All Age Groups, Both Genders (Smetanin & Kobak, 2005)



Type 2 Diabetes

Diabetes incidence and mortality in Alberta

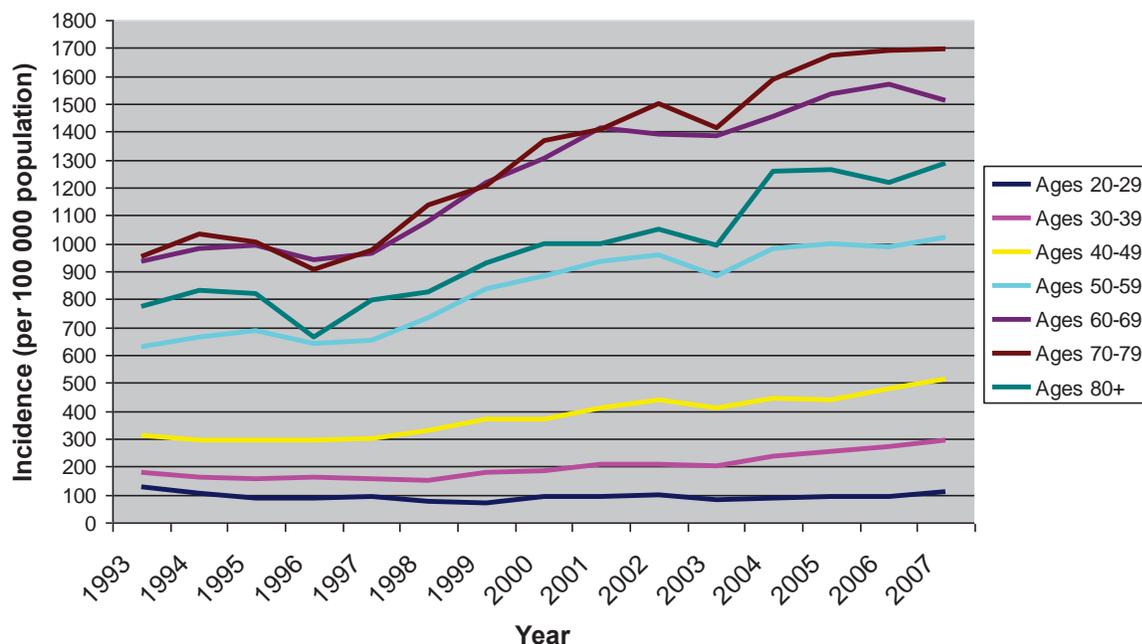
In 2007, 15,376 Albertans age 20 and older were diagnosed with diabetes. Combining these newly-diagnosed cases with existing cases of diabetes, the 2007 prevalence of diabetes in Albertans aged 20 and older was 6.0%. This means that 150,092 Albertans over the age of 20 were living with diabetes in 2007 (Alberta Health and Wellness - Surveillance & Environmental Health, 2009). The burden of type 2 diabetes has been increasing in Alberta over time and varies according to the demographic characteristics of the province's population.

Temporal trends in type 2 diabetes incidence

Figure 2.2 illustrates the temporal trends in type 2 diabetes incidence by age group between 1993 and 2007 in Alberta. Incidence rates are expressed as the number of new diabetes cases per year, per 100,000 members of the population at risk.

Between 1993 and 2007, the incidence rate of diabetes increased in all age groups except those aged 20-29 years. The greatest increases in incidence occurred among the oldest three segments of the Albertan population. Incidence rates (per 100 000 population) increased by 574.8 cases per year among individuals aged 60-69, by 745.6 cases per year among individuals aged 70-79 years, and by 512.8 cases per year among individuals aged 80 and older (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

Figure 2.2 – Temporal Trends in Type 2 Diabetes Incidence by Age Group, 1993 to 2007



Furthermore, the age-standardized prevalence of type 2 diabetes in 2007 was very similarly distributed across Alberta's former 9 health regions, as most regions had a prevalence rate close to 4%. In 2007, the prevalence of type 2 diabetes was highest in the former Northern Lights health region at 5.1%, and lowest in the former Calgary health region at 3.8% (Alberta Health and Wellness - Surveillance & Environmental Health, 2009)⁶.

Undiagnosed diabetes in Alberta

The incidence, prevalence and mortality estimates provided here describe diagnosed cases of diabetes within the province. Epidemiologic research on type 2 diabetes suggests that the true burden of disease is higher, and it has been estimated that up to 50% of people with type 2 diabetes are unaware that they have the condition (Public Health Agency of Canada, 2005). Many cases of diabetes, particularly those in the early and asymptomatic stages, go undiagnosed for 5-12 years, which emphasizes the importance of improved screening practices and diabetes prevention efforts (Leiter et al., 2001).

The Diabetes Screening in Canada (DIASCAN) study used a stratified, randomized selection of family physicians across the country to assess the prevalence of undiagnosed diabetes. Findings from this study revealed that among adults aged 40 years and older, the prevalence of undiagnosed type 2 diabetes is 2.2% (Leiter et al., 2001). This finding is similar to the estimated prevalence of undiagnosed type 2 diabetes (2.8%) in the United States (Cowie et al., 2006).

Diabetes Morbidity and Mortality

In 2007, the age-standardized mortality rate for diabetes in Alberta was 12.6 deaths per 100,000 individuals in the population (453 deaths among Albertans aged 20 and older). The age-standardized mortality rate for diabetes during this period was higher in males (16.3 per 100 000 individuals, 247 deaths among males aged 20 and older) than females (9.7 per 100 000 individuals, 206 deaths among females aged 20 and older)(Alberta Health and Wellness - Surveillance & Environmental Health, 2009). When mortality from all causes is considered, individuals with diabetes are 2 to 4 times more likely to die than individuals without diabetes (Johnson & Vermeulen, 2007). The increased risk of mortality associated with diabetes is especially high in younger adults compared to older adults. For example, individuals aged 30-34 are 6.7 times more likely to die if they have diabetes, whereas people aged 65 and older are less than 2 times more likely to die if they have diabetes as compared to non-diabetics (Johnson & Vermeulen, 2007).

⁶ Note: the age standardized prevalence rates for diabetes (both type 1 and type 2) reflect the prevalence of the disease within the entire Alberta population, and not just for those Albertans who are 20 years of age or older.

The increased risk of mortality among people with diabetes is largely attributable to co-morbid health conditions that develop as a consequence of the metabolic changes associated with diabetes. Albertans with diabetes are more likely to experience several serious health conditions that are summarized below:

- **Cardiovascular disease:** Individuals with diabetes are 2.5 times more likely to experience acute coronary syndrome (heart attack or unstable angina) and heart failure, and 2 times more likely to experience a stroke than individuals without diabetes (Graham et al., 2007).
- **Lower limb amputations:** Individuals with diabetes are 12-18 times more likely to have a lower limb amputation than individuals without diabetes (amputations are the result of atherosclerotic peripheral artery disease or diabetic peripheral neuropathy) (Senior, McMurty, & Tsuyuki, 2007).
- **End-stage renal disease (ESRD):** Individuals with diabetes are 11-15 times more likely to develop ESRD than individuals without diabetes (ESRD is the result of diabetic nephropathy) (Klarenbach, Tonelli, Hemmelgarn, & Jindal, 2007).
- **Poor eye health:** Eye diseases, such as cataracts and glaucoma, are 1.5-2 times more common among individuals with diabetes, and rates of treatment for retinopathy are 6-20 times higher in people with diabetes (Tennant, Rudinsky, & Johnson, 2007).
- **Mental illness:** Affective and anxiety disorders are over 30% more common, and psychotic disorders are 2 times more common among individuals with diabetes compared to individuals without diabetes (L. C. Brown, Svenson, & Beck, 2007).

Projections for Diabetes Prevalence

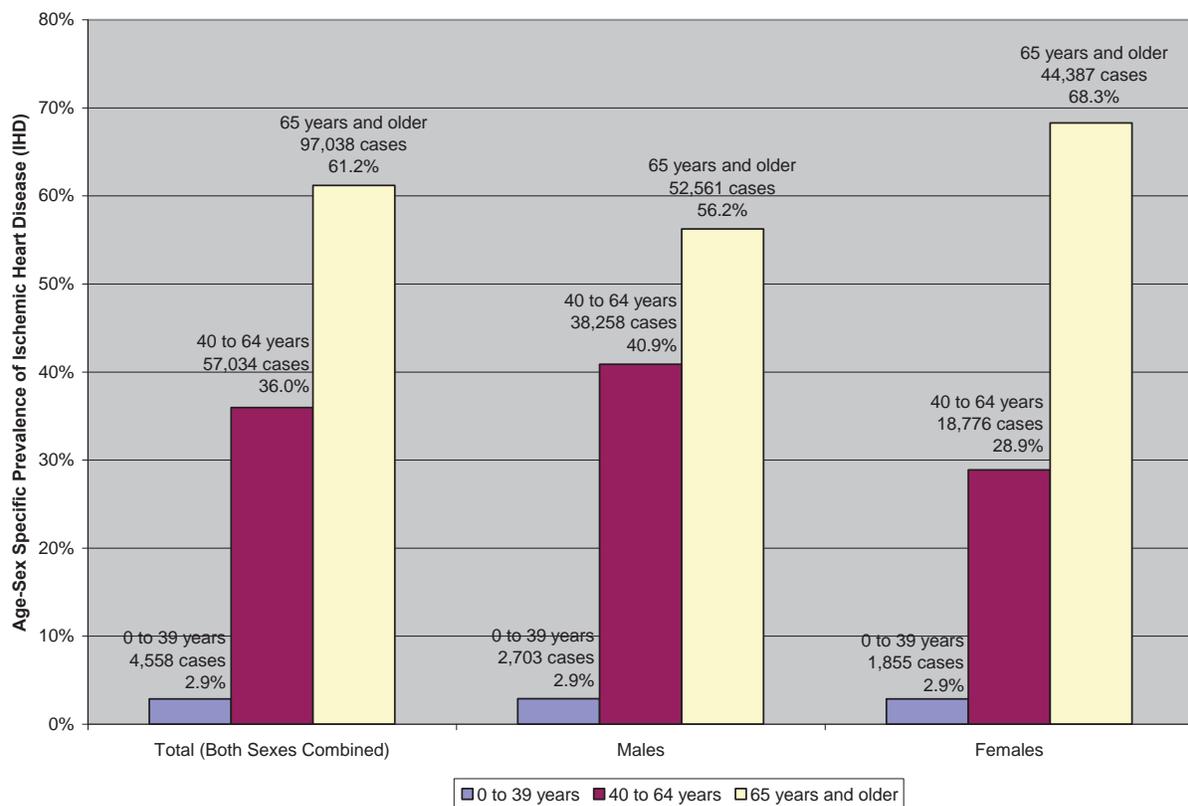
Using Statistics Canada data on population projections and age-specific incidence and prevalence rates of diabetes in Canadians, Ohinmaa and colleagues (2004) projected that the cases of diabetes in Canada will increase from 1.4 million in 2000 to approximately 2.0 million in 2016. This increase in diabetes prevalence is estimated to be highest in Alberta, British Columbia, and the territories. Specifically, between 2000 and 2016, the prevalence of diabetes in Alberta is expected to increase by 85.8%, largely because of a growing population, and a rapidly-aging population (Ohinmaa et al., 2004). Without effective preventive interventions, the burden of diabetes, and associated co-morbidities, will continue to rise in Alberta.

Cardiovascular Disease

Prevalence of Ischemic Heart Disease (IHD)

In 2008, there was estimated 158,635 cases of ischemic heart disease (IHD) in Alberta (93,617 or 59% among males; 65,018 or 41% among females). The majority of these cases were among Albertans aged 65 years and older (97,038 cases or 61.2% of reported cases) (Figure 2.3) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009). When compared by sex, older women are more likely than men to suffer from this form of cardiovascular disease; IHD cases in those over 65 years of age is slightly more prevalent among Albertan women than men (68.3% compared 56.2%)(Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

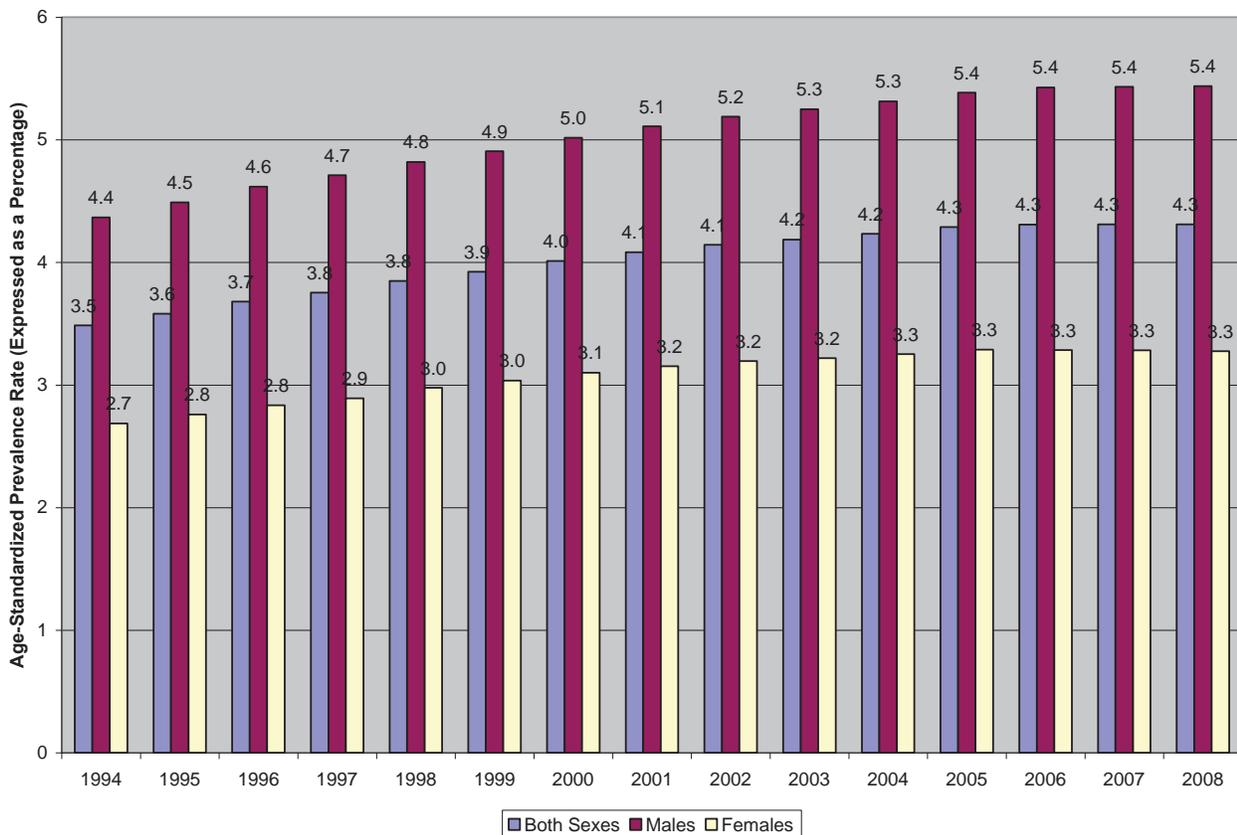
Figure 2.3 – Prevalence of IHD cases (Proportion and Number) in Alberta by Age and Sex (2008) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009)



Since 1994, the number of IHD cases in the province has also nearly doubled (increasing 93% from 82,168 reported cases) as the prevalence among both men and women has gradually increased over time. To a large extent, this increase is likely the result of Alberta’s population getting older and, thus, shifting the age distribution of the province as a whole (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

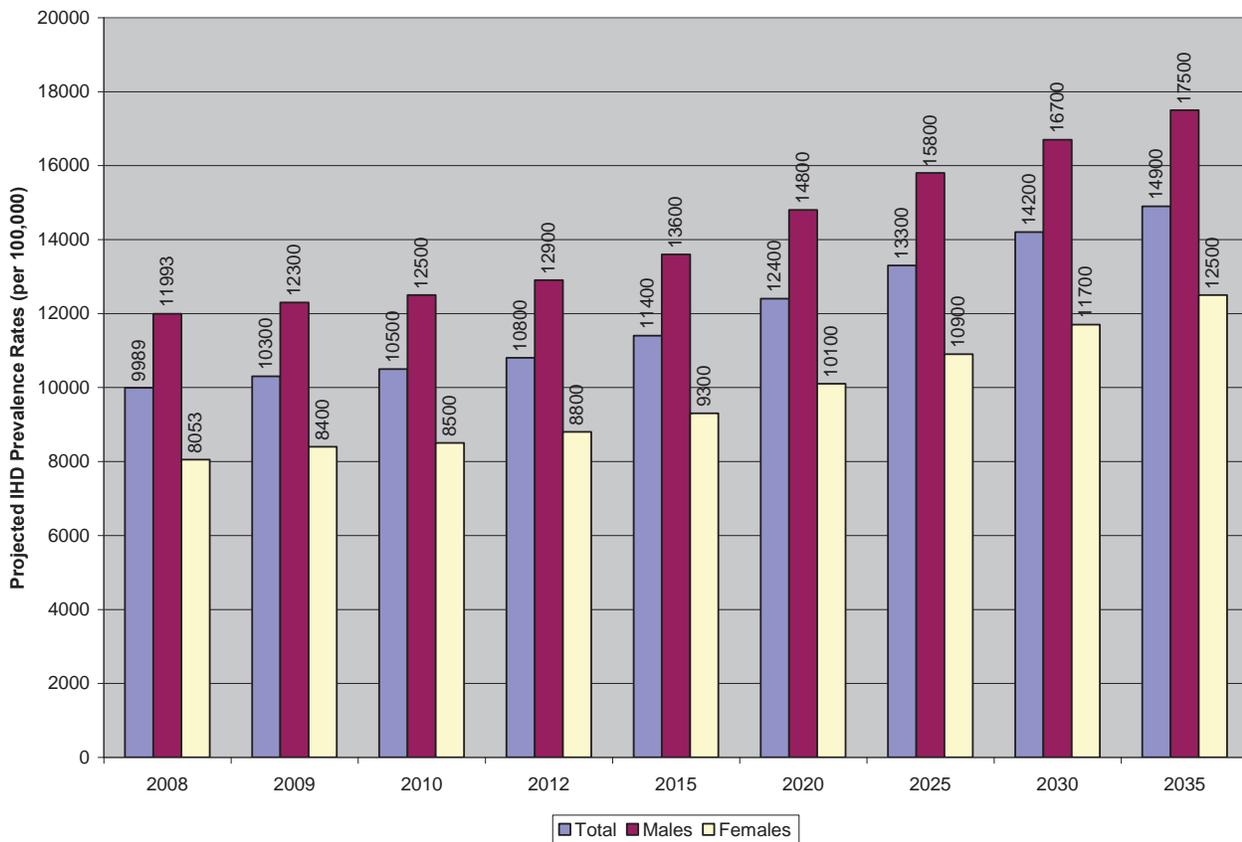
Using another method to estimate prevalence of IHD in Alberta, the age-standardized prevalence of IHD measures the percentage of the population with the condition, which in 2008 was 4.3% (an increase from 3.5% in 1994) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009). When measured by sex, the age-standardized prevalence of IHD in 2008 among Albertan women was 3.3% (an increase from 2.7% in 1994), while the prevalence of among men was 5.4% (an increase from 4.4% in 1994) (Figure 2.4) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

Figure 2.4 – Age-standardized Prevalence of Ischemic Heart Disease (IHD), expressed as a percentage, from 1994 to 2008, by sex for Alberta (Alberta Health and Wellness - Surveillance & Environmental Health, 2009)



Further, Alberta Health and Wellness has estimated that the number of Albertans over the age of 40 with IHD will increase by 135% from 154,072 in 2008 to an estimated prevalence of 362,118 cases by 2035 (Alberta Health and Wellness – Surveillance and Environmental Health Branch, 2008). Using data from Alberta Vital Statistics, amongst other sources, the prevalence rate of IHD for those 40 year or older is projected to increase from 9,989 per 100,000 in 2008 to 14,900 per 100,000 by 2035 which further highlights the need for an effective prevention strategy (Figure 2.5) (Alberta Health and Wellness – Surveillance and Environmental Health Branch, 2008).

Figure 2.5 – Projections of IHD Prevalence (per 100,000) in Alberta, Ages 40 and older (Alberta Health and Wellness – Surveillance and Environmental Health Branch, 2008)



Incidence of Ischemic Heart Disease (IHD)

In 2008, Alberta Health and Wellness identified 14,385 new cases of ischemic heart disease, which equates to an age-standardized incidence rate of 467 new cases per 100,000 people. The majority of these cases were identified among Albertan men (8,536 new cases and a rate of 603.6 per 100,000) and provincial residents over 60 years of age (8,525 new cases; 3059 per 100,000). Since 1994, the number of new IHD cases per year has gradually increased (Figure 2.6), however, the age-standardized incidence rate (both sexes combined) began to decrease after 2004 (Figure 2.7). Once again, the increase observed in the non-age standardized data is likely due to Alberta’s population getting older and the resultant shift in the age distribution of the province’s population as a whole (Alberta Health and Wellness - Surveillance & Environmental Health, 2009). The age-sex specific incidence rate of IHD remained relatively stable between 1994 and 2008, although the risk of IHD was highest among the older age groups (Figure 2.8) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

Figure 2.6 – Incidence of Ischemic Heart Disease (IHD) in Alberta (Number of Cases) Measured by Sex, From 1994 to 2008

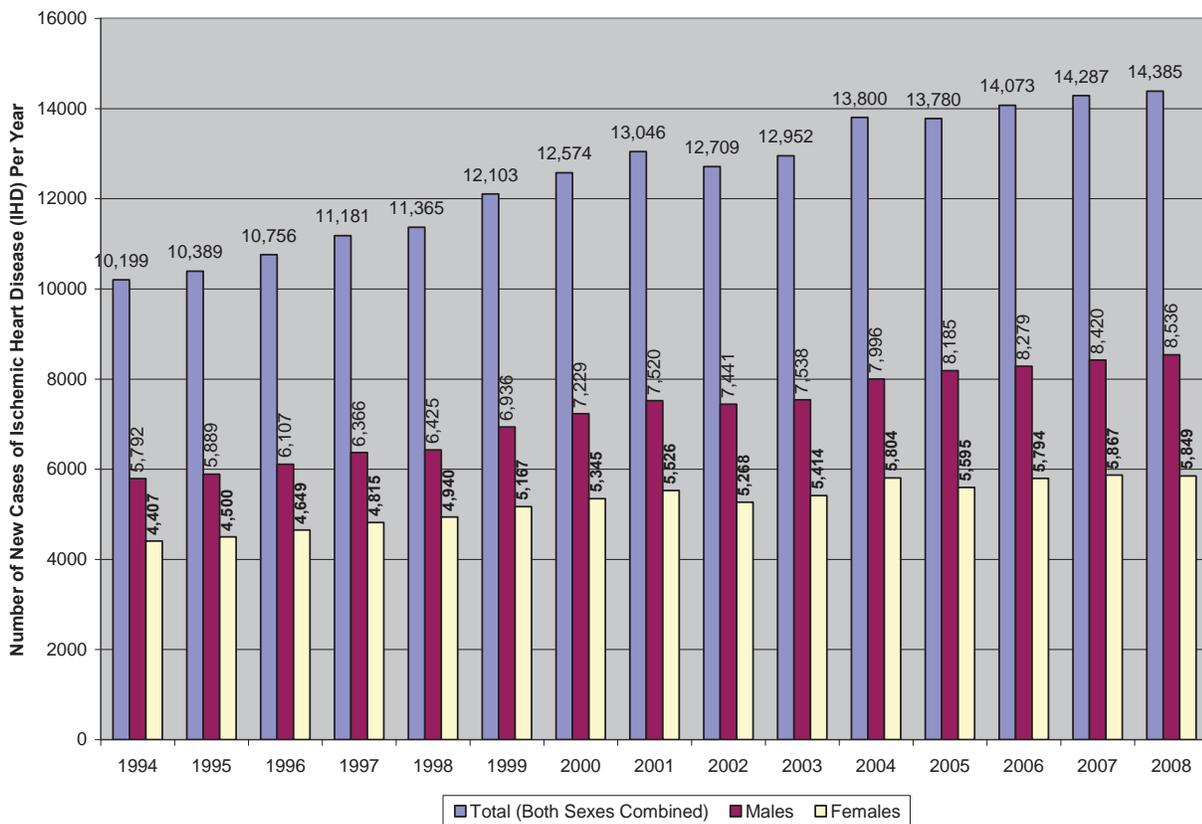


Figure 2.7 – Age-standardized Incidence Rate of Ischemic Heart Disease (IHD) in Alberta, Measured by Sex, from 1994 to 2008.

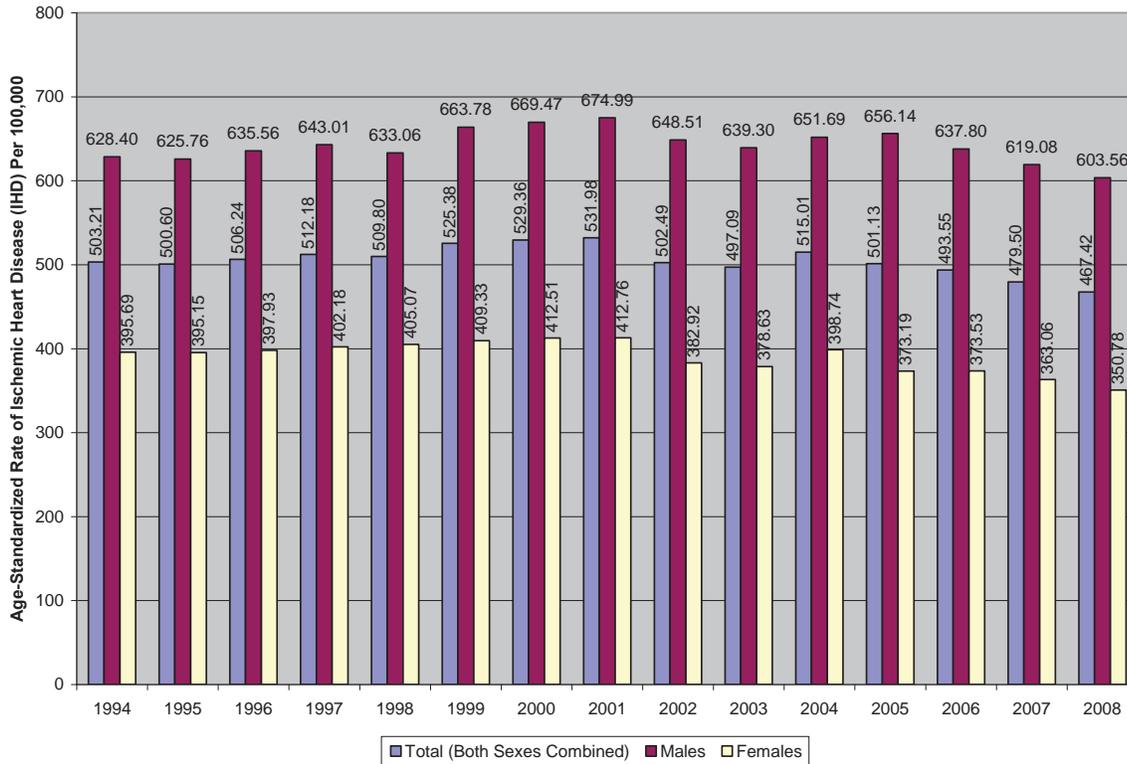
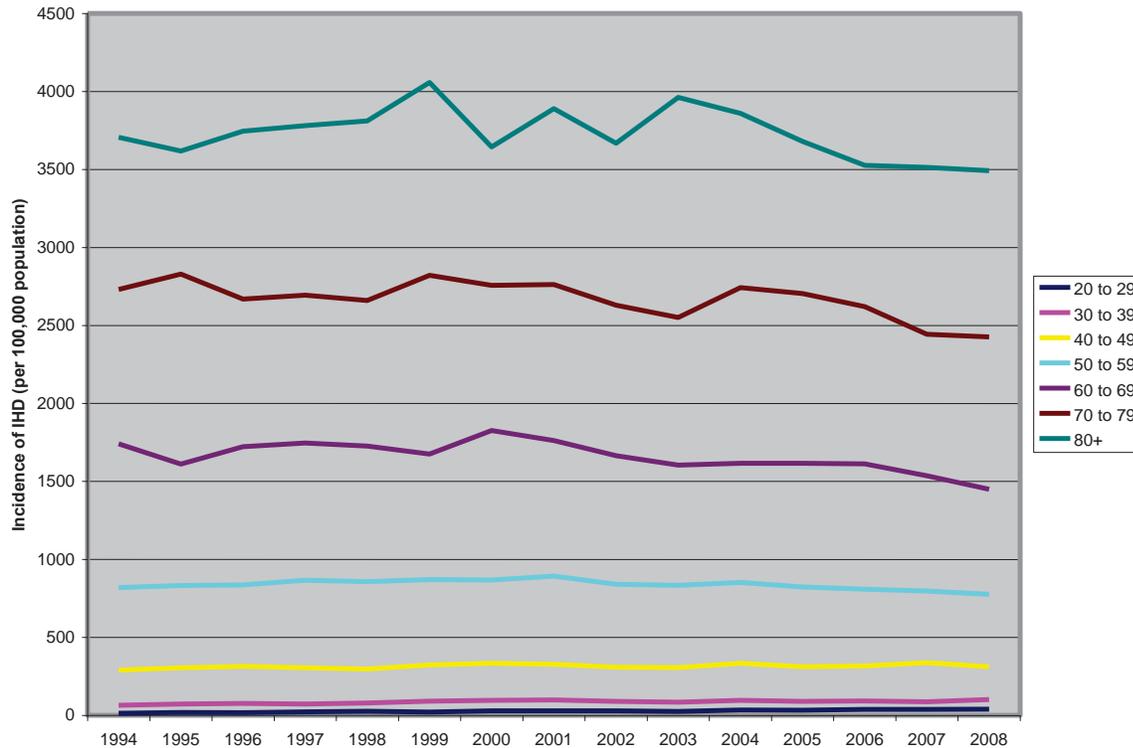


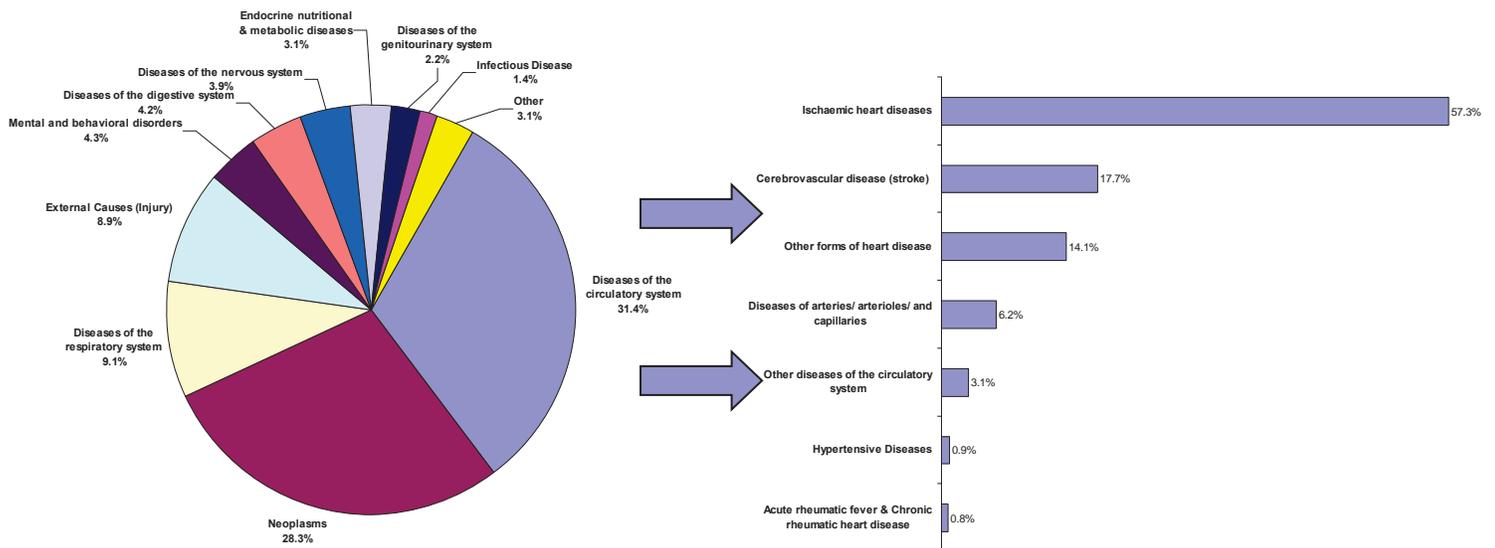
Figure 2.8 – Age-Sex Specific Incidence Rate of Ischemic Heart Disease (IHD) in Alberta, Measured by Age, from 1994 to 2008.



Mortality

In 2007, diseases of the circulatory system accounted for 31.1% of all deaths in Alberta (30.0% among men; 32.4% among women) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009). In terms of ischemic heart disease, 17.9% of all deaths in Alberta in 2007 were attributed to IHD; which also accounted for 57.5% of all deaths attributed to a disease of the circulatory system (Figure 2.13). The overall age-adjusted mortality rate for CVD was 163 deaths per 100,000, but this was significantly higher for Albertan men (204 deaths per 100,000) than women (129 deaths per 100,000) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009). Moreover, the age-standardized mortality rate for IHD in 2007 was 95 deaths per 100,000, which, again, was significantly higher in men (128.7 males; 67.1 females) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

Figure 2.9 – Mortality by Cause of Death, For Diseases of the Circulatory System (Number of Cases) for Alberta, 2007



According to Statistics Canada, age-standardized mortality rates for ischemic heart disease vary significantly when measured by sex; between 2000 and 2004, an average of 164 per 100,000 Albertan men died as a result of ischemic heart disease (compared 84.5 per 100,000 Albertan women) (Public Health Agency of Canada, 2009). For this period, the average mortality rate for IHD in Alberta was 119.9 deaths per 100,000, which is third highest among the provinces and territories, behind only Newfoundland and Labrador (148.8) and Prince Edward Island (133.6) (Public Health Agency of Canada, 2009).

The Economic Burden of Chronic Disease in Alberta

Assessing the economic burden involves calculating both direct and indirect financial costs. Direct health care costs consist of expenditures for hospitals, drugs, physicians, care in other institutions, and additional direct costs. Indirect costs can include the costs of lost economic production by adults due to long- and short-term disability and to premature mortality, defined as death between the ages of 15–74 years; and, the value of time lost by a patient and his or her family members or friends caring for the patient.

When direct and indirect costs are considered together, the combined economic burden of cancer, type 2 diabetes and cardiovascular disease in Alberta is substantial. According to the Economic Burden of Illness in Canada, when the economic costs of each disease are added together the total cost for the province was estimated at \$3.15 billion for the year 2000 (\$1.44 billion for cancer, \$234.8 million for type 2 diabetes and \$1.48 billion for cardiovascular disease) (Public Health Agency of Canada (PHAC), in press). More recent cost analyses, which present higher cost estimates for each disease, are provided below.

Cancer Costs

In a study commissioned by Alberta Health Services in 2009, the total cost of cancer in Alberta was estimated at \$11.8 billion for year 2000 (Alberta Health Services – Cancer Prevention Program & HDR-Decision Economics., 2009). Distinguished by cancer site, the top 5 cost contributors in the province were lung cancer (\$2.3 billion), breast cancer (\$1.2 billion), colon and rectum cancers (\$1.1 billion), prostate cancer (\$766 million) and lymphomas and multiple myeloma (\$677 million) (Table 2.1) (Alberta Health Services – Cancer Prevention Program & HDR-Decision Economics., 2009). The study also estimated that 98% of the total cancer costs in Alberta are, in fact, indirect costs. A reproduction of the report that reviews the economic costs of cancer in Alberta can be provided by AHS' PHIDS portfolio upon request (for contact information, please refer the Acknowledgements page).

Table 2.1 – Total Costs of Cancer in Alberta: Year 2000 (millions of \$) (Alberta Health Services – Cancer Prevention Program & HDR-Decision Economics., 2009)

Cancer	Direct Costs	Indirect Costs ^a	Total Cost ^a
Malignant neoplasms	225.5	11,592.10	11,817.50
1. Other malignant neoplasms	98.6	2,359.00	2,457.60
2. Trachea, bronchus and lung cancers	18.4	2,374.40	2,392.80
3. Breast cancer	8.2	1,206.30	1,214.50
4. Colon and rectum cancers	23.1	1,087.90	1,111.00
5. Prostate cancer	9.1	757.2	766.4
6. Lymphomas and multiple myeloma	18.7	658.9	677.6
7. Leukaemia	11.6	463.9	475.6
8. Pancreas cancer	5.1	437.8	442.9
9. Melanoma and other skin cancers	5.3	375.9	381.2
10. Stomach cancer	5	357.3	362.2
11. Ovary cancer	3.2	270.2	273.4
12. Oesophagus cancer	2.5	255.3	257.8
13. Bladder cancer	5.8	249.5	255.3
14. Liver cancer	2.3	251.2	253.6
15. Corpus uteri cancer	2.2	192.8	194.9
16. Mouth and oropharynx cancers	4.2	153.4	157.6
17. Cervix uteri cancer	2.2	141	143.2

^a mean estimate

Note: Totals may not add due to rounding

Future cost projections for Alberta also estimate that (Alberta Health Services – Cancer Prevention Program & HDR-Decision Economics., 2009):

- The total cost of cancer is projected to increase to \$14.2 billion in 2008, an increase of 20% from 2000;
- The total cost of cancer is projected to increase to \$15.6 billion in 2015, an increase of 32% from 2000; and,
- The total cost of cancer is projected to increase to \$18.0 billion in 2030, an increase of 52% from 2000.

Type 2 Diabetes Costs

According to the Public Health Agency of Canada’s Economic Burden of Illness in Canada, 2000 (EBIC) unpublished report, The total cost of type 2 diabetes in Alberta for the year 2000 was \$234.8 million (Public Health Agency of Canada (PHAC), in press). Direct costs accounted for 52% of the total cost (\$123.1 million), while indirect costs accounted for the remaining 48% of costs (\$111.7 million). Current epidemiological evidence suggests most diabetes cases are the result of unhealthy dietary patterns, physical inactivity, and excess body weight, and that the majority of type 2 diabetes is preventable (Alberti, Zimmet, & Shaw, 2007; James et al., 2003; Schulze & Hu, 2005). Population interventions that successfully decrease these diabetes risk factors could result in significant reductions in overall healthcare costs to the province.

Using Statistics Canada data on population projections and age-specific incidence and prevalence rates of diabetes in Canadians, Ohinmaa and

colleagues (2004) projected that the costs associated with diabetes would increase by 89.9% in Alberta between 2000 and 2016, from \$386.1 million to \$733.3 million⁷. This projected cost increase provides further support for the primary prevention of type 2 diabetes and chronic diseases sharing common risk factors.

Cardiovascular and Cerebrovascular Disease Costs

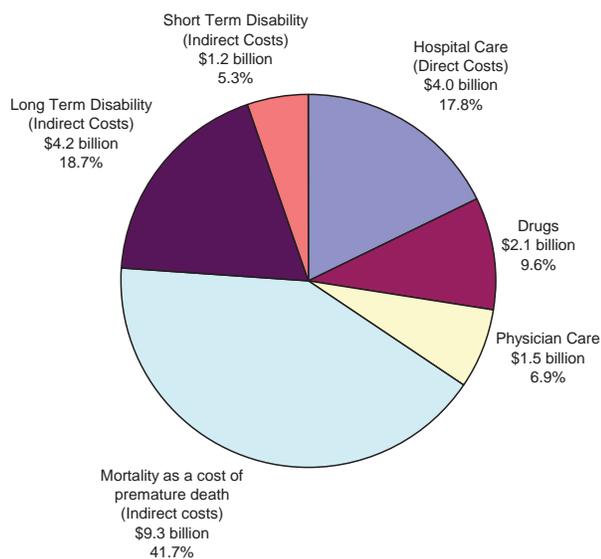
The most recent provincial cost analysis (2000) estimated the cost of cardiovascular disease in Alberta to be \$1.48 billion (direct and indirect costs combined) with hospitalization costs estimated at \$514.8 million or 34% of the total costs (Ontario Chronic Disease Prevention Alliance, 2007). With hospital costs related to cardiovascular diseases expected to increase over time, national and provincial efforts to prevent and effectively manage the diseases are more important than ever.

The estimated financial cost of stroke in Alberta was approximately \$300 million annually in 2005; the majority of this expense was associated with the costs of hospitalizations and long-term disability (Heart and Stroke Foundation of Alberta, NWT & Nunavut, 2005). However, this cost estimate is conservative as a large proportion of stroke patients (36.9%) are not accurately identified in hospital administrative data (Public Health Agency of Canada, 2009). Hospitalization costs related to stroke are dependent on the length of hospital stay and stroke patients generally have longer hospital stays than patients with other chronic health conditions (Public Health Agency of Canada, 2009). Other factors influencing the length of stay of stroke patients in the hospital include: age, as the length of stay is likely to increase with age; the severity of the stroke; and the availability of family and community supports, and rehabilitation services. At the date of publication, a more detailed cost estimate of the economic burden of stroke in Alberta was unavailable.

It is estimated that cardiovascular diseases cost the Canadian economy more than \$22.2 billion every year in physician services, hospital costs, lost wages and decreased productivity (Figure 2.14) (Canadian Heart Health Strategy and Action Plan (CHHS-AP) Steering Committee, 2009). Over one-third (36.4%) of the economic burden of cardiovascular disease in Canada can be attributed to ischemic heart disease (IHD), including heart attacks; IHD accounted for \$8.1 billion in direct and indirect costs in 2000. By comparison, hypertensive diseases and cerebrovascular diseases accounted for \$2.3 billion (10.3%) and \$3.6 billion (16.1%) of the national costs, respectively.

⁷ It should be noted that these cost estimates differ from those within the Economic Burden of Illness Canada (EBIC 2000), due to differences in costing methodology.

Figure 2.10 – Economic Costs of Cardiovascular Diseases in Canada (Direct and Indirect) (Public Health Agency of Canada, 2009)



Nutrition, Physical Activity and Obesity Costs

Poor nutrition, physical inactivity and an unhealthy body weight have also direct and indirect financial costs to the Albertan health care system and economy overall. In a report conducted by the Genuine Progress Index (GPI) Atlantic, commissioned by Alberta Health Services’ Cancer Prevention Program, the total direct and indirect costs of overweight and obesity in Alberta were estimated to be \$1.2 billion in 2005, when direct health care costs, indirect short and long-term disability costs, and premature mortality costs attributable to overweight and obesity were combined (Alberta Health Services Cancer Prevention Program & GPI Atlantic, 2009). The highest costs attributable to overweight and obesity were associated with coronary heart disease (\$299.4 million), type 2 diabetes (\$154.0 million), hypertension (\$121.8 million), and cancer (\$111.6 million, 2005\$). Among the cancer sites, colorectal cancer (\$29.4 million), postmenopausal breast cancer (\$14.3 million), and leukemia (\$10.2 million) represented the highest direct and indirect costs attributable to overweight and obesity in Alberta. A reproduction of the report that reviews the economic costs of obesity in Alberta can be provided by Alberta Health Services’ PHIDS division by request.

The cost of nutritious food is an important determinant of food choices for anyone attempting to lead a healthy lifestyle. In 2008, the average monthly cost of a nutritious food basket, consisting of 51 basic foods that require some food preparation skills, for a family of four in Alberta, was estimated to be \$774 (Alberta Community and Public Health Nutritionists Food Security Subcommittee & Dietitians of Canada, 2009). Comparitively, the estimated maximum average monthly costs of a nutritious food basket for an individual

Albertan man and woman were \$245 and \$180, respectively (Alberta Community and Public Health Nutritionists Food Security Subcommittee & Dietitians of Canada, 2009). Currently, there are no data available to estimate the independent economic costs of poor nutrition and unhealthy eating in Alberta and Canada.

In 2001, physical inactivity was estimated to account for 2.6% of total health care costs in Canada, which represents \$5.3 billion (\$1.6 billion in direct costs and \$3.7 billion in indirect costs) (P. T. Katzmarzyk & Janssen, 2004). It was also estimated that a 10% decrease in the prevalence of physical inactivity in Canada, through an increase of 30 minutes of moderate to vigorous activity 4 days a week, has the potential to reduce direct health expenditures by \$150 million per year (P. T. Katzmarzyk & Janssen, 2004). However, this cost recovery estimate does not consider the costs associated with the implementation of programs or campaigns to promote physical activity. No data are currently available for the costs attributable to physical inactivity within Alberta. At the time of publication, the Alberta Centre for Active Living is currently developing a report to address this knowledge gap (Alberta Cancer Board & Cathy M. Cameron & Associates Inc., 2008).

The lack of economic cost data for both poor nutrition and physical inactivity highlights the difficulty in evaluating the economic impact of individual and group behaviours that are chronic disease risk factors. The economic burden of overweight and obesity, however, as a potential result or by-product of the behaviours is more straightforward. If only a portion of the costs of chronic disease attributable to nutrition, physical activity and weight management risk factors could be reduced (through prevention, early detection and survivorship) the result would be a healthier population, a reduced burden of chronic disease in Alberta, and less financial resources required for the provincial healthcare system. Moreover, the rising direct and indirect costs associated with chronic related to these areas, in combination with the effect of the resultant disease on quality of life, make adherence to recommendations and best practices for behaviour change, population interventions and policy work exceedingly important.

Summary of the Economic Burden

While the economic burden of cancer, type 2 diabetes and cardiovascular disease in Alberta is known to be substantial, further analysis of the costs incurred by the province's health care system still need to be conducted. In most cases, the cost estimates provided here are highly conservative for a number of reasons.

First, the costs of each disease have likely increased since 2000 because of the increased prevalence of these diseases.

Second, the above estimates do not include the total costs associated with poor nutrition, physical inactivity, and overweight and obesity. As noted above, the costs of overweight and obesity in Alberta were estimated at \$1.2 billion in 2005, while cost estimates for poor nutrition and inactivity, respectively, are currently unavailable. The estimation of the costs related to nutrition and physical activity will likely need to follow the same procedure as the estimation for the costs of obesity to derive a total cost for all three known risk factors.

Third, the method used to estimate indirect costs for the EBIC report, the Human Capital method that measures lost production in terms of the lost earnings of a patient or caregiver is known to be a conservative estimate. While it is used to report the indirect costs of type 2 diabetes and cardiovascular disease, the indirect costs of cancer that are reported above were calculated using the Contingent Valuation (Willingness-to-Pay) method. This alternate method measures the amount an individual would pay to reduce the probability of illness or mortality and is more common in international contexts to calculate the economic burden of disease. Using the Human Capital method, the total costs of cancer is estimated at \$1.44 billion (\$225 million in direct costs plus \$1.21 billion in indirect costs) while the Contingent Valuation method estimates the total cost of cancer at \$10.7 billion (\$225 million in direct costs plus \$10.4 billion in indirect costs) (Alberta Health Services – Cancer Prevention Program & HDR-Decision Economics., 2009; Public Health Agency of Canada (PHAC), in press). Because of the differences in estimating indirect costs, a more thorough and current cost-estimate of both direct and indirect costs, encompassing all three diseases as well as the costs associated with nutrition, physical activity and weight management, is required.

Chronic Disease Risk Factors

Determining the cause of chronic diseases like cancer, type 2 diabetes and cardiovascular disease is complex because they are not the result of single, distinct causes. Rather, most diseases are associated (based on differing levels of evidence) with numerous modifiable and non-modifiable risk factors, which are defined as:

- **Non-modifiable risk factors:** those factors that are inherent and cannot be changed, such as age, sex, and genetics; and,
- **Modifiable risk factors:** those factors that are amenable to change, including behavioural factors such as poor diet, physical inactivity, and tobacco use, and related medical conditions such as hypertension and high blood cholesterol levels, among others.

Figure 2.11 provides an overview of several risk factors associated with cancer, type 2 diabetes and cardiovascular disease.

Figure 2.11 – Non-modifiable and modifiable risk factors for major chronic diseases

	Cancer	Type 2 Diabetes	Cardiovascular Diseases	Cerebrovascular Disease
Non-Modifiable Risk Factors				
Age & Sex	X	X	X	X
Race/Ethnicity		X	X	X
Family History/Genetics	X	X	X	X
Modifiable Risk Factors				
Tobacco Use	X	X	X	X
Stress & Mental Health			X	X
Environmental Exposures	X			
Intermediate Physiological Risk Factors		X	X	X
Previous and Existing Health Conditions	X	X	X	X
Poor Nutrition	X	X	X	X
Physical Inactivity	X	X	X	X
Overweight and Obesity	X	X	X	X

Finding the right mix of protective factors, or those factors, behaviours or conditions that protect against and reduce the risk of disease, to negate the effect of non-modifiable and modifiable risk factors is difficult. This is especially true when larger social and political processes have such a heavy influence over the behaviour of individuals. Although this Situational Analysis is concerned with the modifiable risk factors related to nutrition, physical activity, and weight management, a review of additional risk factors is essential to developing a full understanding of chronic disease risk and how it can be reduced through

multiple changes to an individual's lifestyle. While the associations between nutrition, physical activity, and weight management and the development of cancer, type 2 diabetes, cardiovascular disease and stroke are described in detail in Chapter 3, a brief overview of the additional non-modifiable and modifiable risk factors for these diseases is provided below.

Non-Modifiable Risk Factors

Age and Sex

The risk of developing a chronic disease generally increases as individuals grow older:

- In 2006, 53.0% of new cancer cases occurred among Albertans 65 years of age and older, and the overall incidence of cancer increased continuously with older age (Alberta Health Services – Cancer Care, 2009).
- In 2007, the incidence of diabetes among 50 to 59 year old Albertans was 1022.7 cases per 100 000 people, which was nearly double the incidence rate among 40-49 year olds (512.3 cases per 100 000 people). In the same year, incidence rates continued to increase with age, and peaked at 1695.6 cases per 100 000 people among 70-79 year olds (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).
- Similarly, the incidence of ischemic heart disease (IHD) in 2008 for 50 to 59 year olds was 776.4 cases per 100,000, which was double the rate for 40 to 49 year olds (311.3 per 100,000) (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).
- The chance of having a stroke nearly doubles for each decade of life after age 55. Yet while stroke is common among the elderly, over 25 percent of people who have strokes are under age 65 (American Heart Association, 2008).

When disease incidence and mortality rates are measured by sex, the effects are also different for each of the major chronic diseases, as men generally have higher rates:

- The incidence of cancer among males and female Albertans is similar (6168 females and 6581 males were diagnosed with cancer in 2005), however, the risk for certain types of cancer is different for males and females. For example, the large majority of breast cancer occurs among women, as do all cancers of the female reproductive organs, whereas prostate cancer occurs solely in males.
- In Alberta, 55.4% of new type 2 diabetes cases in 2007 occurred in males, while the remaining 44.6% of cases occurred in females.

Similarly, the 2007 prevalence of diabetes in males aged 20 and older was 6.2%, while the prevalence among females of the same age was 5.8% (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).

- In 2008, 59.3% of new ischemic heart disease cases occurred in males, which equated to an age-standardized rate of 603.6 per 100,000 men. By comparison, the rate for Albertan women was 350.7 per 100,000 (Alberta Health and Wellness - Surveillance & Environmental Health, 2009).
- The risk of stroke is higher among men than women, but, overall, more women die of stroke (American Heart Association, 2008). In most age groups, however, men are more likely than women to experience and/or die from an acute ischemic stroke or another cerebrovascular disease; according to 2005 data, the mortality rate of cerebrovascular disease for Albertan males was 38.0 per 100,000 compared to 32.2 per 100,000 for females (Statistics Canada, 2009).

Race and Ethnicity

Certain racial and ethnic groups have higher risk of chronic disease, particularly type 2 diabetes and cardiovascular disease and stroke. Individuals of Aboriginal (First Nations, Métis and Inuit), African, Hispanic, and Asian descent face higher risks of developing type 2 diabetes (Alberti et al., 2007; Canadian Diabetes Association, 2008; Public Health Agency of Canada (PHAC), 2008).

In Alberta, the incidence and prevalence of diabetes is more than twice as high among First Nations people compared to non-First Nations people, and this difference has remained constant from 1995 to 2005 (Hemmelgarn, Toth, King, Crowshoe, & Ralph-Campbell, 2007). The Coordinating Committee for the National Diabetes Strategy (CCNDS) estimates that the prevalence of diabetes in Canada's Aboriginal communities is three to five times higher than the national average (Public Health Agency of Canada, 2005). The Mobile Diabetes Screening Initiative (MDSI) is a travelling health care service that provides diabetes and cardiovascular disease testing and risk assessment in Alberta's Aboriginal off-reserve and remote communities. Measurement of fasting glucose levels taken between 2004-2009 within the MDSI reveal that 46% of non-diabetic Métis people are at risk of diabetes (prediabetic) (Mobile Diabetes Screening Initiative (MDSI), 2009).

Similarly, circulatory diseases are the leading cause of death among First Nations people (Heart and Stroke Foundation of Canada, 2009c). These higher mortality rates are attributable, in part, to much higher rates of smoking, overweight and obesity, and diabetes among the First Nations population in Canada (Public Health Agency of Canada, 2009). Evidence from the United States also demonstrates that Native Americans have a much higher risk of disability

and death from cardiovascular disease and stroke than Caucasians because of higher incidences of high blood pressure and diabetes, which are also prominent concerns for Canada's First Nations population (American Heart Association, 2008). MDSI screening data collected between 2004-2009 reveals that 32% of Métis had elevated total cholesterol and 28% had hypertension (diagnosed and undiagnosed), both strong risk factors for cardiovascular disease (Mobile Diabetes Screening Initiative (MDSI), 2009).

When racial and ethnic backgrounds are considered in relation to chronic disease risk, neither race nor ethnicity alone fully determines the risk. Instead, the prevalence of specific risk factors, such as diabetes, hypertension, weight management and physical inactivity, among different racial and ethnic groups are crucial to understanding the etiology of disease. Accordingly, these factors should be considered in the design, implementation and evaluation of disease prevention initiatives. Alberta's First Nations people represent a high priority population for targeted interventions designed to improve modifiable risk factors for chronic diseases.

Family History and Genetics

The risk of developing cancer, type 2 diabetes, and cardiovascular disease is higher among individuals who have a family history of the disease (Canadian Diabetes Association, 2008; Flossmann, Schulz, & Rothwell, 35; Public Health Agency of Canada (PHAC), 2008; World Cancer Research Fund & American Institute for Cancer Research, 2007):

- A minority (5-10%) of cancers are linked to single inherited genes (World Cancer Research Fund & American Institute for Cancer Research, 2007). Specific types of cancer that occur more often in some families than in the rest of the population include melanoma, and cancers of the breast, ovary, prostate, and colon (National Cancer Institute (NCI), 2006).
- The risk of type 2 diabetes is higher among individuals who have a family history of the disease, particularly in a first-degree relative (Canadian Diabetes Association, 2008; Public Health Agency of Canada (PHAC), 2008). Although an individual's genetic make-up is considered an essential factor in diabetes development, lifestyle factors play a significant role in activating this genetic predisposition (Alberti et al., 2007).
- A consensus of research findings notes that at least 50% of the risk for ischemic heart disease can be attributed to genetics, and that having an immediate family member with a history of IHD can lead to an earlier onset of the disease as well as stroke and cardiac arrhythmias (i.e., irregularities in heart rhythm) (Public Health Agency of Canada, 2009).

- The effect of genetics on stroke risk varies by age; a family history of stroke and other cerebrovascular diseases is only a minimal risk factor for older adults and a moderate risk factor for younger and middle-aged adults (Flossmann et al., 35). Moreover, while there is a demonstrated genetic susceptibility, it is less of a risk factor when compared to more established risk factors and intermediate phenotypes for stroke, such as hypertension, diabetes, ischemic heart disease, hypercholesterolemia, which are also likely to run in families (Flossmann et al., 35).

While genetic background does influence disease risk, it is important to note that an inherited genetic profile is not the sole determinant of chronic disease. Multiple cases of a certain disease in a family may be linked to inherited genes, but may also be due to shared environmental factors.

Modifiable Risk Factors

Tobacco Use

In Alberta, approximately 16% of the population aged 15 years and over were daily smokers, which is slightly higher than the rest of Canada (15.2%)(Public Health Agency of Canada, 2009). Tobacco use and exposure is a well-established cause of cancer, and is also associated with increased risks of type 2 diabetes and cardiovascular disease.

Tobacco accounts for approximately 30% of cancer incidence and mortality in Canada, and has been linked to cancers of the lung, lip, mouth, pharynx, larynx, esophagus, stomach, pancreas, kidney, and bladder (Public Health Agency of Canada, 2004).

Several large, prospective cohort studies suggest that cigarette smoking is independently associated with a modestly increased risk of developing type 2 diabetes (Bazzano, Serdula, & Liu, 2005; Schulze & Hu, 2005). Although smoking cessation has been associated with modest increases in body weight (a strong risk factor for type 2 diabetes), it also increases insulin sensitivity and improves blood cholesterol profiles. The benefits of smoking cessation for reduction of type 2 diabetes risk (and risk of other chronic diseases) outweigh any adverse effects it may have on body weight (Schulze & Hu, 2005).

In 2002, 37,000 deaths related to cardiovascular disease in Canada were attributable to tobacco smoking (Public Health Agency of Canada, 2009). As well, regular and occasional (or passive) smoking are associated with an increased risk of ischemic heart disease (IHD) (Lightwood, Coxson, Bibbins-Domingo, Williams, & Goldman, 2009). The risk of stroke among heavy smokers (more than 40 cigarettes per day) is estimated to be twice that of light smokers (fewer than ten cigarettes per day) (Wolf, D'Agostino, Kannel, Bonita, & Belanger, 1988). However, when an individual quits smoking permanently, their stroke risk is likely to decrease significantly after two years and eventually be

reduced to the same risk level as non-smokers after five years (Wolf et al., 1988).

Although the focus of this situational analysis is on modifiable risk factors related to nutrition and physical activity, smoking is still an important modifiable risk factor for the major chronic diseases. As such, population-level programs and policies targeting tobacco reduction and smoking cessation are a necessary component of a comprehensive chronic disease prevention strategy.

Stress and Mental Health

There are established linkages between perceived mental health, perceived stress, and hypertension and cholesterol levels. However, convincing evidence of the magnitude of these mediating factors on cardiovascular disease and stroke risk is still required (Stegmayr et al., 1997). In general, stress and anger have been found to increase cholesterol levels and result in high blood pressure, arterial damage, and irregular blood flow (Public Health Agency of Canada, 2009). In 2008, nearly three-quarters of Albertans (73.7%) perceived their own mental health as being excellent or very good (Statistics Canada, 2008a). However, an additional 21.4% reported that most days in their life were quite a bit or extremely stressful (Statistics Canada, 2008a). Supporting initiatives intended to decrease stress levels and improve the mental health status of Albertans are likely to have positive effects on cardiovascular disease and stroke rates within the province.

Environmental and Occupational Exposures

Cancer risks are increased by exposure to both ionizing and ultraviolet (UV) radiation, as well as certain industrial cancer-causing agents, activities and workplaces.

Radiation from the sun is widely accepted as a human carcinogen, and is the primary cause of nearly all forms of skin cancer (Public Health Agency of Canada, 2004). Similarly, artificial tanning beds and lamps are also considered carcinogenic (Public Health Agency of Canada, 2004). Skin cancer is the most commonly occurring type of cancer in Canada, and the reduction of sun exposure (and other sources of UV radiation) could substantially reduce the overall incidence of skin cancer. Ionizing radiation comes from cosmic radiation (air travel increases exposure), natural radioactivity present in rocks and soil, medical exposure through X-ray or atomic radiation from weapons or nuclear accidents (World Cancer Research Fund & American Institute for Cancer Research, 2007). Similar to UV radiation, ionizing radiation damages DNA and increases risks of multiple cancers including leukemias, and cancers of the breast and thyroid.

Exposure to cancer-causing agents in certain occupational settings can, to varying degrees, increase the risk of developing cancer (e.g., exposure to

asbestos is convincingly linked to mesothelioma) (Burdorf, Dahhan, & Swuste, 2003; Marinaccio et al., 2007; Price & Ware, 2004). These chemicals include asbestos, benzene, benzidine, cadmium, nickel, or vinyl chloride (National Cancer Institute (NCI), 2006). Taking effective protective measures to reduce, substitute or eliminate exposure to carcinogenics in the environment and workplace is vital for reducing overall cancer risks.

Intermediate Physiological Risk Factors

The metabolic syndrome

The metabolic syndrome refers to the association or clustering of several metabolic abnormalities, including visceral adipose tissue mass, dyslipidemia (elevated triglycerides and low HDL-C), elevated blood pressure and elevated serum glucose, that are predictors for type 2 diabetes, cardiovascular disease, and stroke (Canadian Diabetes Association, 2008; Genest et al., 2009; Reaven, 2006).

According to the American Heart Association (AHA), the metabolic syndrome is present when at least 3 of the following 5 risk factors are present (Grundy et al., 1999):

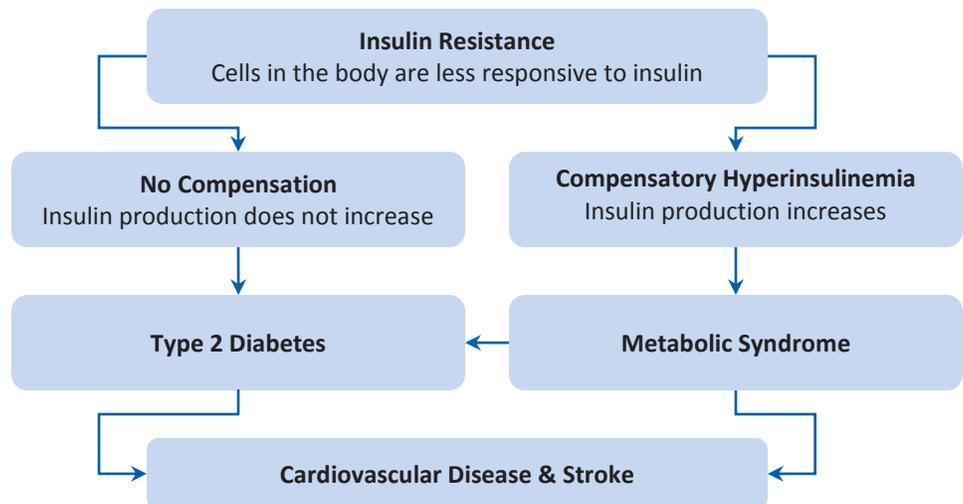
- Abdominal obesity, defined as a waist circumference (WC) ≥ 102 cm in males and WC ≥ 88 cm in females
- High triglycerides (TG), defined as TG ≥ 1.7 mmol/L
- Low high-density lipoprotein cholesterol (HDL-C), defined as HDL-C < 1.0 mmol/L in males and HDL-C < 1.3 mmol/L in females
- Hypertension, defined as blood pressure $\geq 130/85$ mmHg
- Dysglycemia, defined as fasting blood glucose ≥ 5.6 mmol/L

The association between the metabolic syndrome and type 2 diabetes risk is mediated by insulin resistance. Prior to the onset of type 2 diabetes, individuals become insulin resistant. A significant proportion of insulin-resistant individuals overcompensate for this resistance by producing more insulin, which is known as hyperinsulinemia. While these individuals may never develop type 2 diabetes, this compensatory hyperinsulinemia will eventually lead to the development of the metabolic syndrome (particularly, high triglyceride levels, low HDL levels and hypertension) and its associated disease risks (Figure 2.15) (Reaven, 2006). For example, high blood cholesterol, a component of the metabolic syndrome, has been demonstrated to directly increase the risk of a stroke because it can impede the normal flow of blood from the heart to the brain (Golub, 1999).

The identification and treatment of individuals with the metabolic syndrome and its individual components could prevent and significantly reduce the

morbidity and mortality associated with type 2 diabetes, cardiovascular disease, and stroke (Canadian Diabetes Association, 2008; Canadian Stroke Network (CSN) & Heart and Stroke Foundation of Canada (HSFC), 2006), however its clinical utility has been the subject of debate (D. C. Lau, 2009). Traditional and validated tools for cardiovascular risk assessment, such as the Framingham risk score, remain essential for initial evaluation of short-term cardiovascular risk. The use of other indicators of metabolic risk, including those encompassed by the metabolic syndrome, should follow this initial assessment. Management of intermediate risk factors such as high blood cholesterol, dysglycemia, hypertension, and, most importantly, obesity can be achieved through lifestyle modifications, adherence to dietary guidelines and medication usage, if necessary (D. C. Lau, 2009).

Figure 2.12 - Relationships between insulin resistance, the metabolic syndrome, and development of type 2 diabetes, cardiovascular disease, and stroke (Reaven, 2006)



Previous and Existing Health Conditions

An individual's medical history and existing health conditions also influence chronic disease risks. Many such health conditions can be prevented, avoided, or well-managed and as such, are classified as modifiable risk factors.

Cancer

Health conditions associated with an increased risk of cancer include chronic inflammation, hormonal exposure and certain infections:

- Inflammation occurs as a physiological response to infection, foreign bodies, trauma, chemical exposure or other irritation. Over time, chronic inflammatory conditions such as Barrett's esophagus and ulcerative colitis, can result in cellular and DNA damage and the development of cancer (World Cancer Research Fund & American

Institute for Cancer Research, 2007). Consuming adequate levels of vitamins and minerals to support a healthy immune system can protect against chronic inflammation, as can physical activity which is known to exert anti-inflammatory mediators within the body.

- Lifetime exposure to estrogen—increased by early menarche, late menopause, not bearing children, and late (over 30) first pregnancy—increases the risk of breast, ovarian, and endometrial cancers in women. Age at menarche and menopause are highly influenced by nutrition, with high energy diets associated with earlier onset of puberty and late menopause (World Cancer Research Fund & American Institute for Cancer Research, 2007).
- Infectious agents, including viruses, bacteria, and parasites can damage cells and DNA and promote the development of cancer, sometimes by causing chronic inflammation (World Cancer Research Fund & American Institute for Cancer Research, 2007). Human papilloma virus (HPV) is an established cause of cervical cancer, and hepatitis B and C are known causes of liver cancer. Infections with these viruses can often be reduced by avoiding high risk sexual behaviours, and injection drug use (sharing needles) (National Cancer Institute (NCI), 2006).

Type 2 Diabetes

Individuals diagnosed with vascular diseases, polycystic ovary syndrome, acanthosis nigricans, and schizophrenia are at increased risk of developing type 2 diabetes (Canadian Diabetes Association, 2008). Furthermore, women who have experienced gestational diabetes and individuals with pre-diabetes (a component of the metabolic syndrome) face higher risks of developing type 2 diabetes (Alberti et al., 2007; Canadian Diabetes Association, 2008; Public Health Agency of Canada (PHAC), 2008). In Canada, the prevalence of gestational diabetes varies from 3.7% in non-Aboriginal populations to 8-18% in Aboriginal populations (Canadian Diabetes Association, 2008). These women represent an important target population for interventions aimed at reducing type 2 diabetes risk factors.

Pre-diabetes refers to a physiologic state in which blood glucose levels are elevated, but are not high enough for a diagnosis of type 2 diabetes. If left untreated, over 50% of individuals with pre-diabetes will develop type 2 diabetes within 10 years (Public Health Agency of Canada (PHAC), 2008). The Public Health Agency of Canada estimates that pre-diabetes affects approximately 5 million Canadians over the age of 20 years (Public Health Agency of Canada (PHAC), 2008). Although the prevalence of pre-diabetes in Alberta is not known, the DIASCAN study found that the prevalence of pre-diabetes among Canadians older than 40 years was 3.5% (Leiter et al., 2001; Public Health Agency of Canada (PHAC), 2008). The development of type 2

diabetes in individuals with pre-diabetes and those with a history of gestational diabetes can be prevented or significantly delayed through the adoption of a healthy diet, increased physical activity, and weight reduction.

Cardiovascular Disease

Risk of cardiovascular disease (heart disease and stroke) is increased by several health conditions, including transient ischemic attacks, diabetes, and hypertension.

A transient ischemic attack (TIA) is a ‘mini stroke’ caused by changes in the blood supply to the brain that result in stroke-like symptoms and brief neurologic dysfunction, lasting 30-60 minutes (W. W. Zhang, Cadilhac, Donnan, O’Callaghan, & Dewey, 2009). Individuals who have had a TIA are at the highest risk of having a full stroke within two days of the attack (Rothwell et al., 2005). Moreover, within two years of having a TIA, individuals are five times more likely to have an ischemic stroke than the general population (Johnston et al., 2007).

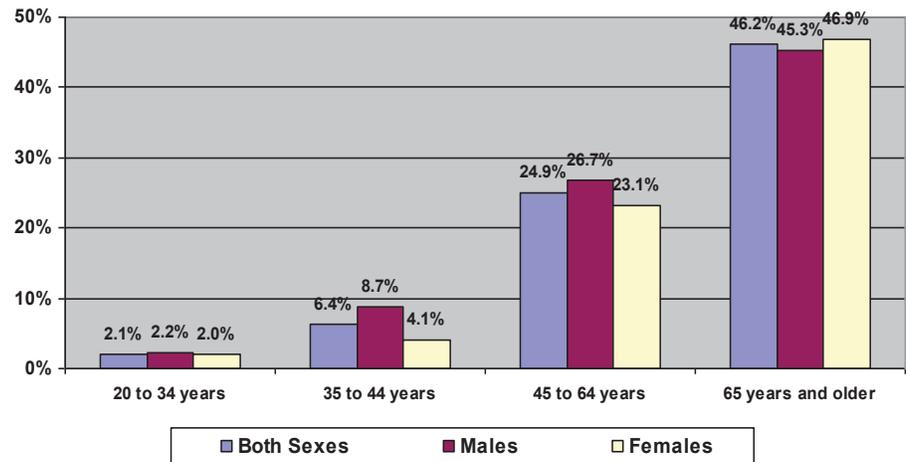
Diabetes, as will be further explored in the following chapter, is another major risk factor for both cardiovascular disease and ischemic stroke. Those who are already diagnosed with type 1 or type 2 diabetes are at high risk for both cardiovascular and cerebrovascular diseases. Almost 20% of stroke victims have diabetes, which is related to high blood sugar levels damaging the blood vessels of the brain (Barrett-Connor & Khaw, 1988). A study conducted at the University of Alberta, found that individuals with type 2 diabetes were twice as likely to have a stroke as those without diabetes (Jeerakathil, Johnson, Simpson, & Majumdar, 2007). Diabetes is also an important risk factor for stroke among younger individuals, with studies suggesting an increase in stroke risk of as much as 10 fold in some younger subgroups (Jeerakathil et al., 2007).

Hypertension or high blood pressure is, by consensus, considered to be the leading risk factor for ischemic heart disease (IHD) and the most consistent predictor of primary and recurrent strokes (Canadian Stroke Network (CSN) & Heart and Stroke Foundation of Canada (HSFC), 2006; Public Health Agency of Canada, 2009; Rosendorff et al., 2007; H. Zhang, Thijs, & Staessen, 2006). It also is likely to double or almost triple the risk of stroke, IHD, peripheral vascular disease and heart failure (Public Health Agency of Canada, 2009). Population-level research suggests that the risk of a heart attack could be reduced by 35.8% among women and 19.5% among men if everyone in the population had normal blood pressure levels (Public Health Agency of Canada, 2009).

Hypertension has also been found to predict stroke risk for up to three decades—from middle age (late 40s and early 50’s) to old age (late 60s and early 70s)—and is the only predictor of stroke that does not differ in severity throughout the middle and later stages of life (Harmsen, Lappas, Rosengren, & Wilhelmsen, 2006). In Alberta, the proportion of those with high blood pressure

increases with age (Figure 2.16): 46.2% of Albertans aged 65 years and over are estimated to have high blood pressure, compared to 24.9% between the ages of 45 and 64 years. When measured by gender, similar proportions of men and women 65 years and older are hypertensive (45.3% and 46.9%, respectively).

Figure 2.13 - Prevalence of High Blood Pressure / Hypertension among Albertans measured by sex and age (Statistics Canada, 2008a).



According to results from the recent Canadian Health Measures Survey released in early 2010, nearly one-fifth (19%) of Canadians aged 20 to 79, roughly 4.6 million people, have hypertension. An additional 20% had readings in the pre-hypertension range, and 61% had normal blood pressure (Statistics Canada, 2008b).

Transient Ischemic Attacks (TIAs), type 2 diabetes, and hypertension can also be prevented and effectively managed by leading a healthy lifestyle and following the recommendations regarding nutrition, physical activity, and weight management that are presented in Chapter 7. Early identification of these health conditions in high risk individuals, accompanied with appropriate disease management as well as coordinated prevention initiatives at the provincial and community levels could significantly reduce rates of cardio- and cerebrovascular disease in Alberta (Canadian Stroke Network(CSN) & Heart and Stroke Foundation of Canada (HSFC), 2006; National Institute of Neurological Disorders and Stroke (NINDS), 2009; Public Health Agency of Canada, 2009).

Summary & Conclusions

The aim of this chapter was to emphasize why the chronic diseases of interest to this Situational Analysis (SA) - cancer, type 2 diabetes and cardiovascular disease – need to be prevented. To summarize:

- While a more current and inclusive cost estimate of both direct and indirect costs is required, all three chronic disease classifications are conservatively estimated to cost the Alberta economy at least \$3.07 billion per year (year 2000 estimate);
- Prevalence statistics estimate that in 2008, there were 14,385 new cases of ischemic heart disease (IHD) in Alberta, increasing the provincial prevalence of the disease to an estimated 158,635 people. In combination with the 2007 estimate of 150,092 Albertans, 20 years of age and older, who were reported to have diabetes (134,716 existing cases and 15,376 new cases), 308,727 Albertans likely suffered from at least one of the two illnesses (not including cancer);
- Mortality statistics note that in 2007, 6,221 Albertans died from a major cardiovascular disease (31.1%), 5,513 from cancer (27.6%), and 455 from diabetes (2.3%) (type unspecified), accounting for 61.0% of all-cause mortality in the province;
- The incidence (number of new cases) of all three chronic diseases will continue to rise without an effective disease prevention and control strategy that addresses behavioural and social determinants of health;

Moving forward, the next chapter will consist of the Recognition and Analysis of Chronic disease-related Evidence (RACE) component of the E2D2 model. Specifically, the current state of evidence on cancer, type 2 diabetes, and cardiovascular diseases related to nutrition, physical activity, and weight management will be examined in terms of behaviours that have demonstrated either an increasing or a reducing effect on chronic disease risk.

Chapter 3: Recognition and Analysis of Chronic Disease Related Evidence (RACE)

Part 1-Literature Review

Key Points

- Evidence from high-quality systematic reviews, meta-analyses, large-scale prospective cohort studies and expert agreements demonstrates that cancer, type 2 diabetes and cardiovascular disease can be prevented through appropriate lifestyle behaviours related to nutrition, physical activity and body weight.
- A dietary pattern that contributes to reduced risk of these chronic diseases is characterized by :
 - Large amounts of vegetables, fruits and other plant based foods and sufficient amounts of dietary fibre
 - Moderate amounts of total fat, lower levels of saturated and trans fat, accompanied by relatively higher proportions of polyunsaturated fats, including essential fatty acids
 - Moderate amounts of red meat and low levels of processed meats
 - Low to moderate amounts of alcohol
 - Lower levels of sodium and salty foods
 - Minimal consumption of foods that promote weight gain, including energy dense foods with low nutrient density and sugar-sweetened beverages
- Adequate levels of physical activity are associated with a 20-40% risk reduction in several prevalent types of cancer (colon cancer, breast cancer, endometrial cancer), a 25-35% risk reduction in type 2 diabetes, and a 40-50% risk reduction in coronary heart disease.
- The maintenance of a healthy body weight is one of the most effective ways to prevent cancer, type 2 diabetes, and cardiovascular disease. Being obese (as defined using the Body Mass Index or Waist Circumference) more than doubles a person's risk of developing cancers of the endometrium, kidney, or pancreas, type 2 diabetes, hypertension, coronary artery disease, and pulmonary embolism.

Introduction

Arguably, the combination of physical inactivity, poor nutrition and obesity has surpassed tobacco as the leading causal pathway for chronic disease in the Western world (Doll & Peto, 1981; Rennert, 2007). With respect to diet and physical activity, evidence continues to mount that what we eat, or fail to eat in some cases, and how active and inactive we are, can affect our risk of developing chronic disease. As such, a greater understanding about the relationship between nutrition and physical activity and chronic disease risk is critical to the development of effective preventive approaches to reduce rates of disease incidence and mortality.

Alberta Health Services, in agreement with global chronic disease stakeholders, asserts that the risk of developing chronic disease involves a mix of inherent factors, such as age, genetics and family history, as well as behavioural factors such as diet, physical activity practices, and maintenance of a healthy weight, among others (Alberta Cancer Board, 2007; Canadian Cancer Society (CCS), 2004; World Cancer Research Fund & American Institute for Cancer Research, 2007). The interplay between nutrition and physical activity and specific cancer sites, types of diabetes and cardiovascular diseases is very complex and the number of effective interventions to reduce the long-term risk, incidence and mortality of these diseases related to these behaviours is limited⁸.

This chapter will review an international body of evidence on nutrition, physical activity, and weight management as it relates to chronic disease risk and prevention. The aim of reviewing this literature is to situate Alberta within the broader context of the chronic disease prevention community and to inform the development and implementation of programs and policies that will be deliberate, context-specific, and geographically sensitive efforts to improve the nutrition and physical activity behaviours of Albertans. This review recognizes that evidence – standardized, epidemiological and empirically-based – is constantly being produced and disseminated, and that this is only a snapshot of the relevant knowledge that is currently available.

⁸ Cancer incidence is defined as the frequency of new cancer cases during a pre-specified period of time. As a measure of effect, examining incidence is a good way to assess the impact of the disease at multiple levels. By comparison, cancer mortality is the number of deaths due to cancer during a period of time. Both incidence and mortality can be affected by prevention, screening and research.

Sources of Evidence

The evidence in this chapter comes from high-quality systematic reviews, meta-analyses, prospective studies of community-based cohorts, and expert agreements on recommendations for chronic disease prevention. Several large, long-running cohort studies have investigated the relationship between lifestyle factors and chronic disease using robust methods, and the findings of this research make up a large amount of the evidence base in this area. These studies include:

- The Nurses Health Study that enrolled 121,700 female nurses aged 30-55 years in 1976 (Fung, Schulze, Manson, Willett, & Hu, 2004).
- The Iowa Women's Health Study that enrolled 41,836 women aged 55-69 years in 1986 (Meyer et al., 2000).
- The Health Professionals Follow-up Study that enrolled 42,504 male health professionals aged 40-75 in 1986 (van Dam, Rimm, Willett, Stampfer, & Hu, 2002).
- The Framingham Heart Study that to date has enrolled 14,228 participants within three respective cohorts (5,209 in 1948, 5,124 in 1971, and 4,095 in 2005) (The Framingham Heart Study & The National Heart, Lung and Blood Institute, 2009);
- The Physicians' Health Study that enrolled 21,271 male physicians aged 40-84 years in 1982 (Manson et al., 1992).
- The European Prospective Investigation into Cancer (EPIC) Study that enrolled 520,000 men and women aged 39-69 years from 10 European countries between 1992 and 2000 (Gonzalez, 2006); and,
- The Women's Health Initiative that enrolled 93,676 post-menopausal women aged between 1994 and 1998 (Hsia et al., 2005).

In addition to evidence from observational research, evidence from randomized trials is also highlighted with respect to chronic disease prevention among high risk populations. Because of the long latency period associated with the development of chronic diseases and the nature of behaviours related to nutrition, physical activity, and weight management, there is limited experimental evidence from randomized-controlled trials in the general population.

Two other key sources of evidence are:

- **The World Health Organization & Food and Agriculture Organization of the United Nations (WHO/FAO) technical report, entitled Diet, Nutrition, and the Prevention of Chronic Diseases (2003)** (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

The technical report was the outcome of a joint WHO/FAO expert consultation involving a review of the latest scientific evidence on the relationship between nutrition and major chronic diseases, including cancer, cardiovascular disease and type 2 diabetes (Nishida, Uauy, Kumanyika, & Shetty, 2004). The Consultation recognized the importance of physical activity in the context of diet and health, and included evidence on physical activity and disease risk where applicable. Body weight, as both a mediating risk factor for the relationship between diet and chronic disease and an independent risk factor, was also included in the WHO/FAO review (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

- **The World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) Global Report - Food, Nutrition, Physical Activity and the Prevention of Cancer: A Global Perspective (2007)** (World Cancer Research Fund & American Institute for Cancer Research, 2007).

Building on the previous edition published in 1997, the 2007 Global Report is considered by many in the cancer prevention field to be the most thorough and systematic review of cancer-related evidence as it relates to food, nutrition, and physical activity (World Cancer Research Fund & American Institute for Cancer Research, 2007)⁹. A 21-member expert panel reviewed and judged evidence from more than 20,000 research studies, in total, and acknowledged and synthesized the best 7,000 studies in the Global Report. The review of evidence and recommendations was designed to be integrated, broad-based, global, and to have a major impact in helping populations and individuals reduce their risk of cancer and to improve their positive health and well-being. A context-specific limitation of the Global Report is that the report does not thoroughly incorporate a great deal of Canadian evidence and Canada-based researchers are visibly absent from the panel. For that reason, Alberta Health Services' Population Health Innovation and Decision Support division will utilize the evidence and key recommendations from the report that are most applicable and beneficial in the Alberta context, and utilize its investigative framework for interpreting existing Canadian-based cancer risk factors and health behaviours.

⁹ The term 'prevention' is used in the Global Report to refer to a reduction in cancer occurrence, "such that at any age fewer people have cancer than otherwise would be the case."

Levels of Evidence

The strength of evidence in the WCRF / AICR and the WHO/FAO reports (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003) was based on criteria established by the World Cancer Research Fund in 1997 (World Cancer Research Fund, 1997). The WHO/FAO (2003) report used the 1997 criteria with slight modification to permit the inclusion of controlled trials where applicable, while the WCRF/AICR(2007) used revised criteria for defining evidence. The strength of associations between dietary factors, physical activity, body weight and disease risk were categorized as convincing, probable, possible, or insufficient according to pre-established criteria used in each report (Table 3.1) (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Evidence from both technical reports and other high-quality systematic reviews suggests that the majority of chronic diseases could be prevented through a healthy diet, regular physical activity, and the maintenance of a healthy body weight. The evidence related to these three lifestyle factors and disease risk is detailed below.

Table 3.1 - Levels of evidence as defined within the WCRF/AICR (2007) and WHO/FAO(2003) reports (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003)

Level of evidence	Criteria for defining level of evidence	
	WHO/FAO (2003)	WCRF/AICR (2007)
‘Convincing’	<ul style="list-style-type: none"> Epidemiological studies show consistent associations between exposure and disease, with little or no evidence to the contrary Evidence is based on a substantial number of studies including prospective observational studies and where relevant, randomized controlled trials of sufficient size, duration and quality showing consistent effects Association should be biologically plausible 	<p><i>The following are generally required:</i></p> <ul style="list-style-type: none"> Evidence from more than one study type and from at least two independent cohort studies No substantial unexplained heterogeneity within or between study types or in different populations relating to the presence or absence of an association, or direction of effect Good quality studies to exclude with confidence the possibility that the observed association results from random or systematic error, including confounding, measurement error, and selection bias Presence of a plausible biological gradient (‘dose response’) in the association Strong and plausible experimental evidence, either from human studies or relevant animal models, that typical human exposures can lead to relevant (cancer) outcomes Relationship between exposure and disease should be robust enough to be highly unlikely to be modified by emerging evidence in the near future
‘Probable’	<ul style="list-style-type: none"> Epidemiological studies show fairly consistent associations between exposure and disease, but there are perceived shortcomings in the available evidence or evidence to the contrary, which precludes a more definite judgment Shortcomings may include: insufficient number or duration of trials/studies; inadequate sample sizes; incomplete follow-up Laboratory evidence is usually supportive Association should be biologically plausible 	<p><i>The following are generally required:</i></p> <ul style="list-style-type: none"> Evidence from at least two independent cohort studies, or at least five case control studies No substantial unexplained heterogeneity between or within study types in the presence or absence of an association or direction of effect Good quality studies to exclude with confidence the possibility that the observed association results from random or systemic error Evidence for biological plausibility
‘Possible’ (WHO/FAO)	<ul style="list-style-type: none"> Evidence based mainly on findings from case-control and cross-sectional studies Insufficient randomized controlled trials, observational studies or non-randomized controlled trials are available 	<ul style="list-style-type: none"> Evidence may have methodological flaws or be limited in amount but shows a generally consistent direction of effect.
‘Limited – suggestive’ (WCRF/AICR)	<ul style="list-style-type: none"> Evidence from non-epidemiological studies, such as clinical and laboratory investigations, is supportive More trials are required to support the tentative associations Association should be biologically plausible. 	<p><i>The following are generally required:</i></p> <ul style="list-style-type: none"> Evidence from at least two independent cohort studies or at least five case-control studies A generally consistent direction of effect, though some unexplained heterogeneity may be present Evidence for biological plausibility
‘Insufficient’ (WHO/FAO)	<ul style="list-style-type: none"> Evidence based on findings of a few studies which are suggestive, but are insufficient to establish an association 	<ul style="list-style-type: none"> Evidence is so limited that no firm conclusion can be made Evidence might be limited by the number of studies available, by inconsistency of direction of effect, by poor quality of studies, or by a combination of these factors.
‘Limited – no conclusion’ (WCRF/AICR)	<ul style="list-style-type: none"> Limited or no evidence available from randomized controlled trials More well designed research is required to support the tentative associations. 	<ul style="list-style-type: none"> Further good quality research could show that an exposure-disease (cancer) relationship does exist (or does not exist)
‘Substantial effect on risk unlikely’	n/a	<ul style="list-style-type: none"> Evidence strong enough to support judgment that a particular nutrition or physical activity exposure is unlikely to have a substantial causal relation to (cancer) outcomes. <p><i>The following were generally required:</i></p> <ul style="list-style-type: none"> Evidence from more than one study type and at least 2 independent cohort studies Summary estimate of effect close to 1.0 for comparison of high versus low exposure categories No substantial unexplained heterogeneity between or within study types in the presence or absence of an association or direction of effect Good quality studies to exclude the possibility that the absence of an observed association results from random or systematic error Absence of a biological gradient (dose response) Absence of strong and plausible evidence from human or animal models that typical human exposures lead to relevant (cancer) outcomes

Nutrition

Introduction

A healthy and nutritious diet is integral to reducing the risk and preventing the development of chronic disease. According to the World Health Organization, recommendations for the diet of populations and individuals should include the following (World Health Organization, 2009):

- Achieve energy balance and a healthy weight
- Limit energy intake from total fats and shift fat consumption away from saturated fats to unsaturated fats and towards the elimination of trans-fatty acids
- Increase consumption of fruits and vegetables, and legumes, whole grains and nuts
- Limit the intake of free sugars
- Limit salt (sodium) consumption from all sources and ensure that salt is iodized

Making similar recommendations, the most recent version of Eating Well with Canada's Food Guide (CFG) is a practical health promotion and disease prevention tool because it focuses on the amount and type of foods Canadians need as part of a healthy eating pattern (Health Canada, 2007). The Food Guide recommendations are based on the average nutrient requirements of males and females at different life stages, and specify how many Food Guide Servings should be eaten from each of the four food groups. CFG also provides guidance on making healthy choices within each food group. For example, within the food groups, individuals are encouraged to consume dark green and orange vegetables on a daily basis, eat whole grain products at least as often as refined grain products, choose low-fat dairy and milk-alternative products, and eat meat alternatives (beans, lentils, tofu) and fish more often. Canadians are also advised to include a small amount of unsaturated fat each day and to satisfy thirst with water, and to choose foods lower in fat, sugar and salt. The aim of the Guide, as defined by Health Canada, is to help Canadians:

- Consume adequate amounts of vitamins, minerals and other nutrients
- Reduce risks of obesity, type 2 diabetes, heart disease, cancer and osteoporosis
- Achieve overall health and vitality

The associations between nutrition, specific eating behaviours and chronic disease risk, nutrition, and specific eating behaviours are multidimensional. Overall, research has shown that certain foods and nutrients have preventive properties and can significantly protect against specific chronic diseases, while other foods and consumption patterns have been shown to increase their risk.

The association between nutrition and disease risk can be articulated in terms of dose-responses, as well as risk reductions and increases. A dose-response describes the change in effect (i.e. in an individual's risk of developing a given chronic disease) caused by differing levels of exposure (i.e. when certain foods are consumed in different amounts). This effect can either be positive (risk-reducing) or negative (risk-increasing).

Specific foods, food groups and dietary patterns have demonstrated associations, both positive and negative, with the risk for particular chronic diseases. Due to the complex nature of foods and dietary patterns as a whole, it can be challenging to define consistent relationships between nutritional factors and health or disease status. Nevertheless, a number of dietary components that have been consistently associated with one or more of the major chronic diseases included in this situational analysis were identified through a review of the epidemiologic evidence. The specific associations with chronic disease are described in greater detail below, for the following dietary components:

- **Plant foods and a high-fibre diet**, which include vegetables, fruits, pulses (legumes), nuts, seeds, herbs and spices. Most plant foods, particularly non-starchy vegetables, are high in nutrients and dietary fibre and low in energy density. Pulses (legumes) are also high in protein, while nuts and seeds are a source of healthier unsaturated fatty acids.
- **Animal foods**, which include meat, poultry, fish, eggs, and dairy products. The nutritional value and fat content of animal foods depend on the type of animal, as well as the methods by which the food is reared, processed and prepared.
- **Fats and oils** are energy dense constituents of food supplies and diets found in both animal and plant foods including meat, milk and dairy products, vegetable oils, seeds, and nuts as well as processed foods.
- **Sodium** is an elemental micronutrient that is found in table salt and many foods, particularly packaged food products. Salt is added to foods to increase flavour, but also for a variety of other reasons including preservation, to increase food safety, and to achieve a desired structure or texture in the food product.
- **Alcoholic drinks** are liquids containing ethanol including beers and ciders, wines and spirits (liquors and liqueurs).
- **Food and drinks that promote weight gain** are typically energy-dense, processed foods that are comprised of substantial amounts of fat or sugar.

- **Other dietary components** that have been proposed to influence chronic disease risk. Research to date, however, has not confirmed associations between these factors and risks of disease.

Following this overview is a summary of all relationships between dietary factors and the development of chronic disease, including specific summaries for cancer, type 2 diabetes, and cardiovascular disease.

Dietary Components and the Risk of Chronic Disease

Plant foods and a high-fibre diet

Plant-based diets, including large amounts of fruits and vegetables and other high-fibre foods such as whole grains and legumes have been associated with reductions in risk for all three of the major chronic diseases highlighted in this report.

The WCRF/AICR Global Report found probable evidence that foods containing dietary fibre are protective against colon cancer and that non-starchy fruits and vegetables are protective against cancers of the mouth, pharynx, larynx, esophagus, and stomach (cancers of the upper digestive tract). Similarly, The WHO/FAO (2003) concluded that probable evidence supports a relationship between higher fibre intakes and reduced risk of both type 2 diabetes and coronary heart disease (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

While the total quantity of dietary carbohydrate (simple sugars and complex carbohydrates) has not been associated with diabetes risk in epidemiological studies, the fibre content of diets does appear to influence diabetes risk (F. B. Hu, van Dam, & Liu, 2001; Parillo & Riccardi, 2004; Schulze & Hu, 2005; Steyn et al., 2004). Multiple cohort studies, including the Nurses' Health Study, Iowa Women's Health Study, and Health Professionals Follow-up Study, have shown a protective effect for dietary fibre on diabetes risk, independent of age, BMI, smoking status and physical activity level (Parillo & Riccardi, 2004; Steyn et al., 2004). When other variables were controlled in these studies, the relative risk for type 2 diabetes was 28-36% lower for individuals in the highest quintile (e.g. >23.6 g total fibre or >8.1 g cereal fibre per day) for dietary fibre consumption compared to those in the lowest quintile (e.g. <15.3g total fibre or <3.2g cereal fibre per day) (Meyer et al., 2000; Salmerón et al., 1997; Steyn et al., 2004). The evidence is probable rather than convincing due to the fact that experimental studies suggest that it is the soluble forms of fibre (e.g. from foods like legumes and oatmeal) exerting benefit; while cohort studies suggest it is the insoluble forms (whole grains, cereal fibre) that are protective (F. B. Hu et al., 2001; Schulze & Hu, 2005; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

In addition to reducing absolute risk of coronary heart disease, a diet high in fibre can also have a positive effect on blood pressure, obesity, insulin resistance and clotting factors, which are all independent risk factors for CHD (Anderson & Hanna, 1999). These conclusions correspond with the results of a meta-analysis of 10 prospective cohort studies from the United States and Europe conducted in 2004 (Pereira et al., 2004). After adjusting for demographics, body mass index, and lifestyle factors, the analysis concluded that a high dietary fibre intake was associated with a 14% decrease in risk of all coronary events and a 27% decrease in risk of coronary death. Moreover, fibre from cereals and fruits had strong inverse associations with CHD risk, while fibre from vegetables showed only weak-to-moderate associations (Pereira et al., 2004).

Although more research may be necessary to clarify the effects of each type of fibre on the risks of various chronic diseases, the general recommendation for adults to consume 25-30g of fibre per day from a variety of whole grains, fruits and vegetables, and legumes is likely to protect against upper gastrointestinal tract cancers, colon cancer, type 2 diabetes, and coronary heart disease (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Animal foods

While relationships between specific animal foods and type 2 diabetes or cardiovascular disease risk were not identified in the context of this literature review, there was evidence of a relationship between certain animal foods and cancer risk. The WCRF/AICR Global Report found convincing evidence that both red meat and processed meat are associated with an increased risk of colorectal cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007). The food category 'red meat' includes beef, pork, lamb, and goat meat from domesticated animals, while 'processed meat' refers to meats that have been smoked, cured, salted, or preserved using chemical additives (World Cancer Research Fund & American Institute for Cancer Research, 2007). Furthermore, the WCRF/AICR (2007) also determined that modes of preparation for animal food can influence the development of cancer. The Global Report (2007) found probable evidence that smoked, grilled or barbequed (charbroiled) animal foods increased the risk of stomach cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007).

The WCRF/AICR (2007) also found probable evidence of a relationship between milk consumption and a reduced risk of colorectal cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007). It must be noted though, that this relationship is not necessarily true for all dairy products. For example, the Global report noted that "although milk and cheese are

included in the general category of dairy products, their different nutritional composition and consumption patterns may result in different findings' for a reduced risk in colorectal cancer. Adding more complexity is the WCRF/AICR (2007) finding that high dietary intakes of calcium (greater than 1500 mg per day) are a probable cause of prostate cancer. Although milk and other dairy products are the primary food source of calcium in countries like Canada, there is limited evidence to suggest that milk and dairy foods (as opposed to calcium, a specific micronutrient) and prostate cancer (the association only held true for the mineral calcium). Balancing the probable influences of milk intake on colorectal cancer and calcium on prostate cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007), it is important that individuals consume adequate amounts of milk without exceeding recommended limits for dietary calcium.

Fats and oils

The fat composition of the diet, both in terms of quantity and quality (types of fat), has been found to influence risks of both type 2 diabetes and cardiovascular diseases. The WHO/FAO (2003) found probable evidence of a relationship between a high saturated fat intake and increased risk of type 2 diabetes, and convincing evidence that a high dietary fat intake increases the risk of developing cardiovascular diseases, including coronary heart disease and stroke through effects on blood lipids (cholesterol), blood pressure, arterial function and inflammation (Melanson, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

For type 2 diabetes, the type of fat in the diet is likely more important than the total amount of fat in the diet (F. B. Hu et al., 2001; Parillo & Riccardi, 2004; Schulze & Hu, 2005; Steyn et al., 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). High saturated fat intakes likely increase the risk of type 2 diabetes, while higher intakes of polyunsaturated fats from vegetable sources likely protect against type 2 diabetes (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Several cohort studies (Nurses' Health Study, Iowa Women's Study, EPIC-Norfolk Study, Health Professionals Follow-up Study) have found that low intakes of polyunsaturated fats, and a higher ratio of saturated fat to polyunsaturated fat are associated with increased risk of type 2 diabetes (Parillo & Riccardi, 2004; Schulze & Hu, 2005). The relationships between dietary fat and diabetes risk are probable rather than convincing because the observed association is somewhat inconsistent across studies. This inconsistency may be due to differences in the characteristics of study populations (e.g. age, sex, BMI and physical activity levels which can influence insulin sensitivity) and failure to control for potentially confounding dietary factors such as a low dietary fibre intake (F. B.

Hu et al., 2001). As well, some studies evaluated insulin resistance rather than diabetes risk as the main endpoint (F. B. Hu et al., 2001; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Both the type and amount of fat in the diet influence cardiovascular disease risk (Melanson, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). This finding of the WHO/FAO (2003) is further substantiated by several systematic reviews which demonstrated that:

- The modification of both dietary fat and cholesterol intake can reduce CVD risks by 16% and related-mortality by 9%(Hooper et al., 2001);
- Each 5% increase of energy intake from saturated fat, compared with energy intake from carbohydrates, is associated with a 17% increase in the risk of coronary heart disease (RR 1.17; 95% CI) (F. B. Hu et al., 1997);
- Using energy from non-hydrogenated, unsaturated fats to replace 5% of energy from saturated fats can reduce the risk of CHD by 42%; while replacing 2% of energy from trans-fats with unsaturated fats can reduce the risk of CVD by 53%(F. B. Hu et al., 1997).
- The longer the behaviour modification of dietary fat is maintained, the greater the effect it will have for minimizing the risk of CVD and CHD over the life course (Hooper et al., 2001).

Considering this evidence, moderation of total dietary fat, particularly trans and saturated fats, as well as cholesterol is recommended (Hooper et al., 2001). Specifically, saturated fat in the diet should be reduced to $\leq 10\%$ of total energy intake among adults, and $\leq 7\%$ of total energy intake among individuals at higher risk of diabetes and heart disease (Steyn et al., 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Fat intake from dairy and meat sources (containing saturated fat), as well as partially hydrogenated oils and processed foods made with these oils (sources of trans fat) should be limited (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Instead, dietary fat should come mainly from plants and fatty fish (sources of unsaturated fats and essential omega-3 fatty acids) to promote good cardiovascular health and, secondarily, the prevention of type 2 diabetes (Melanson, 2007).

Sodium

Dietary sodium, or salt, is associated with increased risks for both cancer, and cardiovascular disease. The WCRF/AICR Global Report found probable evidence to support a relationship between intake of salted foods and increased risks of

stomach cancer. In contrast, the relationship between sodium and cerebro- and cardiovascular diseases is based on convincing evidence and has become a well-recognized public health concern in recent years (Hooper et al., 2001; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

The sodium-CVD relationship is largely mediated by the direct association between high sodium intakes and hypertension (high blood pressure), one of the strongest risk factors for cardiovascular and cerebrovascular diseases (Canadian Stroke Network (CSN) & Heart and Stroke Foundation of Canada (HSFC), 2006; Hooper et al., 2001; Rosendorff et al., 2007; H. Zhang et al., 2006). In a systematic review of clinical intervention trials of dietary salt reduction and the effect on blood pressure, a reduction in sodium intake by 1610-1840mg per day was associated with reduced systolic/diastolic blood pressure in both hypertensive (-4.8/-1.9mmHg) and normotensive (-2.5/-1.1mmHg) individuals (Cutler, Follmann, & Allender, 1997). Using observational data from population studies, it has been estimated that a universal reduction in sodium intake by 1150mg per day would lead to a 22% reduction in stroke mortality and a 16% reduction in deaths from coronary heart disease (Law, Frost, & Wald, 1991). Canadian research estimates that a universal reduction in sodium intake of 1840mg/day would prevent approximately 11,550 cardiovascular disease events per year (in Canada) (Penz, Joffres, & Campbell, 2008).

This evidence as well as the fact that most Albertans consume excess amounts of sodium (see Chapter 4), provide the basis for recommending reductions in sodium consumption. Sodium intake should be limited to 2300mg/day to effectively prevent and reduce the burden of hypertension, cardiovascular disease, cerebrovascular disease, as well as stomach cancer (Institute of Medicine (U.S.). Panel on Dietary Reference Intakes for Electrolytes and Water, 2004; Srinath Reddy & Katan, 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Alcoholic drinks

The relationship between alcohol consumption and chronic disease risk varies according to the chronic disease in question. Moderate amounts of alcohol seem to have protective effects against type 2 diabetes and cardiovascular disease; however, the opposite is true for cancer.

The WCRF/AICR Global Report (2007) found convincing evidence that alcoholic drinks, regardless of the type of drink can cause cancers of the mouth, pharynx, larynx, and esophagus as well as colorectal cancer among men, and breast cancer in both men and women (World Cancer Research Fund & American

Institute for Cancer Research, 2007). The extent to which alcoholic drinks are a cause of various cancers depends on the frequency and amount of alcohol drunk over a person's lifetime.

The associations between alcohol consumption and type 2 diabetes and cardiovascular disease are complex. The WHO/FAO (2003) found convincing evidence that low to moderate alcohol intake decreases the risk of coronary heart disease and insufficient evidence that moderate alcohol intake influenced type 2 diabetes risk (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Recent literature, however, suggests that moderate alcohol consumption may also be associated with a lower risk of type 2 diabetes (Parillo & Riccardi, 2004; Schulze & Hu, 2005).

Low to moderate alcohol consumption can protect against the risk of coronary heart disease through changes in lipids and haemostatic factors (Rimm, Williams, Fosher, Criqui, & Stampfer, 1999; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). In fact, the consumption of 30g of alcohol (1 to 2 drinks) per day has been estimated to reduce the risk of CHD by 24.7% (Rimm et al., 1999). However, drinking alcohol regularly in excess of the recommended intake can lead to weight gain, increased blood pressure and triglyceride levels, which are all risk factors for coronary heart disease and other cardiovascular diseases (Murray et al., 2002). Binge drinking, in particular, even at relatively infrequent intervals, increases the risk of both CHD (with a hazard ratio (HR) of 1.10 for women 2.26 for men at 95% CI) and hypertension (with a HR of 1.57 for men at 95% CI) (Murray et al., 2002).

Similarly, most studies investigating the relationship between alcohol consumption and type 2 diabetes have observed a U-shaped association, with diabetes risk being lowest among light and moderate drinkers and highest in heavy drinkers (Parillo & Riccardi, 2004; Schulze & Hu, 2005). A systematic review of 18 prospective cohort studies evaluated the association between alcohol intake and type 2 diabetes, and found that compared to no alcohol use, moderate consumption (1-3 drinks per day) was associated with a 33% to 56% lower incidence of diabetes (Howard, Arnsten, & Gourevitch, 2004). Heavy alcohol consumption (>3 drinks per day) was associated with a 43% increase in diabetes incidence (Howard et al., 2004). Similarly, a meta-analysis of 15 prospective cohort studies found that moderate alcohol consumption (0.5-4 drinks per day) was associated with a 30% lower risk of developing diabetes compared to no alcohol consumption or excess alcohol consumption (>3 drinks per day) (Koppes, Dekker, Hendriks, Bouter, & Heine, 2005).

While moderate alcohol consumption may protect against type 2 diabetes and cardiovascular disease, this beneficial effect could also be mediated by dietary factors and other aspects of lifestyle that are associated with moderate alcohol consumption (Parillo & Riccardi, 2004). Any public health messaging regarding protective effects of alcohol against chronic disease must also strongly emphasize the detriments of heavy drinking and consider the effects of alcohol on total chronic disease risk (including cancer risk), as well as more immediate social implications.

Foods and drinks that promote weight gain

Given the strong associations between obesity and risks of multiple types of cancer, type 2 diabetes, and cardiovascular diseases, a diet that is conducive to the achievement and maintenance of a healthy body weight will indirectly protect against these chronic diseases. Although weight gain can result from an excess energy (calorie) intake (relative to energy expenditure) from any food, certain foods have been associated with weight gain. Energy dense foods and sugary drinks have been convincingly associated with the development of obesity (World Cancer Research Fund & American Institute for Cancer Research, 2007). The practical recommendations to balance calorie intake with energy expenditure, and avoid sugary drinks and energy dense foods can indirectly decrease chronic disease risk by protecting against weight gain.

Other dietary components

Numerous other dietary components have been investigated in relation to their influence on risks of cancer, type 2 diabetes, and cardiovascular disease. For many of these dietary components though, the evidence is not strong enough to demonstrate convincing or probable associations and further investigation is necessary. For a number of these dietary components, including certain vitamins, minerals and other food compounds, evidence exists to support at least a probable association with chronic disease; however, it is difficult to make explicit and practical recommendations in the context of a total diet approach that can include such specific details.

Convincing and probable evidence indicates that arsenic, which is a naturally occurring element found in drinking water, causes lung cancer and skin cancer, respectively (Science Foundation Alberta, 2009; World Cancer Research Fund & American Institute for Cancer Research, 2007)¹⁰. While this is in fact true, it may be less relevant within the Alberta context, as the composition of potable water is regulated by the Alberta Government and levels of potential

¹⁰ The Alberta government regulates water treatment using the Environmental Protection and Enhancement Act, and works with Alberta Health and Wellness and Alberta Health Services to ensure drinking water quality. Alberta's treatment performance standards are the most stringent in Canada. Alberta law requires water from treatment facilities meet the standards indicated in Health Canada's Guidelines for Canadian Drinking Water Quality.

carcinogenic compounds and other toxins are monitored. In addition, the WCRE/AICR (2007) found limited or suggestive evidence of protective relationships between foods containing fibre and esophageal cancer, fish and colorectal cancer, and milk and bladder cancer as well as risk-increasing relationships between red and processed meats and esophageal cancer, high-temperature drinks and esophageal cancer, total fat and lung and post-menopausal breast cancer, smoked foods and stomach cancer, and grilled, broiled or barbequed animal foods and stomach cancer. These relationships require further investigation before specific conclusions and dietary recommendations can be made.

The relationships between diabetes risk and several other dietary characteristics, including omega-3 fatty acids, trans fats, processed meat, glycemic index, and certain vitamins and minerals (e.g. Vitamin E, chromium, magnesium) have also been investigated. To date, evidence on these relationships is inconsistent and not strong enough to justify specific dietary recommendations related to type 2 diabetes prevention (Schulze & Hu, 2005; Steyn et al., 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Other dietary factors that may influence and mediate CVD risk include caffeine and meal frequency, however more research is required to examine these associations. Vitamins and minerals such as potassium, magnesium, and calcium are also associated with a reduced CVD risk, while suggested associations between vitamins E, C and B and a reduced risk have been disproved in recent years (Albert et al., 2008; Kang et al., 2009; Lee et al., 2005; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Overall, plant-based diets with minimal processed foods and sodium intake (resulting in a lower risk of hypertension) will provide adequate levels of these specific nutrients and will contribute to good cardiovascular health (Melanson, 2007). When considered together, the influence of other dietary factors on CVD risk emphasize the importance of an overall nutritious diet than simply individual dietary components.

Summary of the Disease-Specific Effects of Foods and other Dietary Factors

Cancer

The relationships between foods and nutritional patterns are complex and vary by cancer site. There are very few types of food and drinks that have convincingly been shown to reduce the risk of cancer in a dose-response manner research is required to examine these associations. Overall though, foods containing dietary fibre and milk have been identified as probable

reducers of colorectal cancer risk and non-starchy vegetables and fruits show a probable link to reducing the risk of cancers of the mouth, pharynx, larynx, esophagus and stomach. In contrast, the WCRF / AICR synthesis of existing research found convincing evidence that red meats and processed meats are associated with an increased risk of colorectal cancer, and that alcoholic beverages of all types contribute to the development of cancers of the mouth, pharynx, larynx, and esophagus, as well as colorectal cancer among men and pre- and post-menopausal breast cancer among women (World Cancer Research Fund & American Institute for Cancer Research, 2007). Additionally, evidence suggests that salted foods, as well as smoked, grilled or barbecued (charboiled) animal foods are probable causes of stomach cancer; and, diets high in calcium are probable causes of prostate cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007).

Type 2 Diabetes

Epidemiological research has not revealed any convincing associations between specific dietary factors and the risk of type 2 diabetes. While uncertainty exists regarding the relationship between nutrition and type 2 diabetes, the WHO/FAO (2003) technical report and other literature reviews have consistent conclusions regarding a diet that likely protects against type 2 diabetes. Specifically, diets containing low amounts of fibre and unsaturated fats and high amounts of saturated fat appear to be associated with an increased risk of type 2 diabetes (Alberti et al., 2007; Bazzano et al., 2005; F. B. Hu et al., 2001; van Dam et al., 2002; van Dam, 2003). Moderate alcohol consumption may reduce type 2 diabetes risk, while excess alcohol consumption may increase the risk (Parillo & Riccardi, 2004; Schulze & Hu, 2005). Furthermore, since excess body weight increases the risk of diabetes, a diet that is lower in calories and conducive to the maintenance of a healthy body weight is indirectly protective against type 2 diabetes (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Cardiovascular Disease

Dietary associations for cardiovascular diseases (CVDs) and recommendations for behavioural modifications to reduce CVD risk are well-established (Melanson, 2007). According to the World Health Organization & Food and Agriculture Organization of the United Nations (WHO/FAO) 2003 technical report *Diet, Nutrition and the Prevention of Chronic Diseases*, dietary components that convincingly decrease the risk of developing cardiovascular disease include: fish and fish oils; vegetables and fruits (including berries); and low to moderate alcohol intake, among others (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). In contrast, dietary factors that convincingly increase the risk of CVD include: trans-fatty acids; high sodium intake; and high alcohol intake, among others

(World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Overview of relationships between nutrition and chronic disease

Figure 3.1 summarizes the relationships between diet and chronic disease that are discussed above. It is based on evidence from the WCRF/AICR Global Report (2007), the WHO/FAO technical report (2003), and other relevant sources.

Figure 3.1 - Nutrition and the risk of chronic disease

Dietary Components	Cancer Sites										Type 2 Diabetes	Cardiovascular Disease	
	Colorectum	Mouth	Pharynx	Esophagus	Breast (pre-Menopausal)	Breast (post-Menopausal)	Liver	Prostate	Stomach	Larynx			Lung
Plant foods and a high fibre diet													
Foods containing fibre, high fibre diets, or non-starch polysaccharides	↓(P)											↓(P)	↓(P)
Non-starchy vegetables		↓(P)	↓(P)	↓(P)					↓(P)	↓(P)			↓(C)
Fruits		↓(P)	↓(P)	↓(P)									↓(C)
Animal foods									↓(P)	↓(P)	↓(P)		
Red and Processed Meat	↑(C)												
Smoked, grilled or charbroiled animal foods									↑(P)				
Milk	↓(P)												
Diets high in calcium								↑(P)					
Fats and oils													
High total fat intake													↑(C)
High saturated fat intake												↑(P)	↑(C)
Higher intake of polyunsaturated fat, essential fatty acids												↓(P)	↓(C), ↓(P) (depending on specific type of mono or polyunsaturated fat)
Trans fat													↑(C)
Dietary cholesterol													↑(P)
Sodium													
Salt, salted and salty foods									↓(P)				
High sodium intake													↑(C)
Alcoholic drinks													
Low-moderate alcohol consumption	↑(C) men ↑(P) women	↑(C)	↑(C)	↑(C)	↑(C)	↑(C)	↑(P)					↓based on recent evidence	↓(C)
Excess alcohol consumption	↑(C), men only	↑(C)	↑(C)	↑(C)	↑(C)	↑(C)						↑(C)	↑(C)
Food and drinks that promote weight gain*													
High intakes of energy-dense micronutrient poor foods	↑(C)			↑(C)	↓(P)	↑(C)						↑(C)	↑(C)
High intakes of sugar-sweetened beverages	↑(C)			↑(C)	↓(P)	↑(C)						↑(P)	↑(P)
High intakes of dietary fibre	↑(C)			↑(C)	↓(P)	↑(C)						↓(C)	↓(C)

*The relationships between these dietary components and chronic disease risk are indirect, and are mediated by the effect of the association between that dietary component and risk of overweight or obesity. That is, the directional relationship and strength of evidence provided in the table refers to the relationship between the dietary component and risk of weight gain and obesity, which goes on to influence chronic disease risk. Other types of cancer associated with excess body weight that are not included in this table because of a lack of association with specific dietary components include cancers of the pancreas, endometrium, kidney, and gallbladder.

Legend

↑ - Increases risk of disease

↓ - Decreases risk of disease (protective effect)

P - Supported by probable evidence, as defined by the WHO/FAO (2003) for type 2 diabetes and CVD risk associations, and by the WCRF/AICR (2007) for cancer risk associations

C - Supported by convincing evidence, as defined by the WHO/FAO (2003) for type 2 diabetes and CVD risk associations, and by the WCRF/AICR (2007) for cancer risk associations

Overall, the evidence reviewed within this section suggests that a diet conducive to the maintenance of good health and nutritional status, and the prevention of chronic disease is characterized by:

- Large amounts of vegetables, fruits and other plant based foods and sufficient amounts of dietary fibre
- Moderate amounts of total fat, lower levels of saturated and trans fat, accompanied by relatively higher proportions of polyunsaturated fats, including essential fatty acids
- Moderate amounts of red meat and low levels of processed meats
- Low to moderate amounts of alcohol
- Lower levels of sodium and salty foods
- Minimal consumption of foods that promote weight gain, including energy dense foods with low nutrient density and sugar-sweetened beverages

More specific details about a diet that promotes chronic disease risk reduction and overall health and nutrient adequacy is provided in Chapter 7 of this report.

Physical Activity

Introduction

The association between physical activity and the reduced risk of chronic disease is well-established. In 2003, the World Health Organization concluded that physical activity was convincingly associated with reduced risk of cancer, type 2 diabetes, and cardiovascular disease, while physical inactivity was convincingly associated with increased risk of developing any of the three illnesses (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

The 2007 WCRF / AICR Global Report classifies physical activity into four types:

- Occupational (performed at work);
- Household (in the home);
- Transport (such as traveling to and from work); and,
- Recreational (leisure and exercise).

Defining which types of physical activity are most effective in preventing chronic disease is dependent on the intensity and duration of the activity, which determine the amount of energy required to perform it. For example, the amount of energy required to perform a light physical activity in the period of one hour may be the same as the energy required to perform a moderate or vigorous activity over a shorter period of time. Accordingly, evaluating different physical activities in terms of their ability to prevent specific diseases can be difficult (World Cancer Research Fund & American Institute for Cancer Research, 2007).

Generally speaking, the more physically active people are, the healthier they will be. In terms of intensity, the more intense the physical activity, the greater protective effect for disease it will have (Lee, 2003). According to the World Health Organization (WHO), regular physical activity of sufficient intensity and duration (at least 30 minutes of moderate-to-vigorous physical activity most days of the week) is convincingly associated with a reduced risk of developing a chronic disease; the more intense and consistent the activity, the greater protective effect it will have (International Union Against Cancer, 2004.; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

The level of any physical activity is determined by a combination of the frequency, intensity, and duration of the activity. To measure the intensity of any physical activity, metabolic equivalents (METs) are used. A MET value describes the intensity of the activity relative to a person's resting metabolic rate, while also considering that person's age, sex, activity experience, and level

of physical fitness. The different MET levels of intensity are stratified into the following categories, which are equivalent to the examples of physical activity presented in [Table 3.1](#).

Table 3.1 – Intensity Levels and Associated Examples of Physical Activity (World Cancer Research Fund & American Institute for Cancer Research, 2007)

Intensity Level	Metabolic Equivalent (METs)	Examples of Physical Activity
Vigorous	≥ 6 METs	Running, Aerobics, Bicycling, Swimming, Ice Skating
Moderate	3-5.9 METs	Brisk Walking, Gardening, Low Impact Dancing, Skateboarding
Light	<3 METs	Easy Walking, Yoga, Fishing/Hunting, Sexual Activity
Sedentary	Inactive	N/A

The evidence reviewed here is supportive of a convincing protective effect of physical activity against several types of cancer, type 2 diabetes, and cardiovascular disease. Details about the associations between physical activity and each of these diseases are highlighted below:

Physical Activity and the Risk of Cancer

The International Agency for Research on Cancer (IACR) estimates that 25% of cancer cases worldwide are caused by overweight or obesity and a sedentary, inactive lifestyle (Vainio, Bianchini, International Agency for Research on Cancer, IARC Working Group on the Evaluation of Cancer-Preventive Strategies, & World Health Organization, 2002). Biomedical researchers in the cancer prevention field propose that being physically inactive and sedentary helps to trigger specific biological processes that can lead to specific cancers. Much of this research has focused on the relationship between physical inactivity, energy balance and expenditure and the development of cancer through effects on body composition, insulin resistance, inflammation, endogenous sex hormones, and metabolic factors/hormones (Campbell & McTiernan, 2007; Westerlind, 2003). Research has also demonstrated that being physically active exerts a “cancer-preventive effect” that enhances cellular development and potentially immune function to prevent the development of cancer carcinogenesis, while physical inactivity increases the carcinogenetic risk (Friedenreich & Orenstein, 2002; Rogers, Colbert, Greiner, Perkins, & Hursting, 2008; Rundle, 2005). Individuals who are physically inactive also put themselves at a higher risk for developing most chronic diseases, not just cancer.

The 2007 Global Report established that all forms of physical activity protect against specific types of cancer (World Cancer Research Fund, 1997). This

statement is well-substantiated by numerous epidemiological studies that indicate how physical activity has different risk associations with different types of cancer (Thune & Furberg, 2001; World Cancer Research Fund, 1997). The clearest association between physical activity and cancer risk exists for colon cancer in men and breast cancer in women (Lee, 2003). Convincing evidence suggests that high levels of overall physical activity of high intensity and duration protect against the risk of colon cancer, while similar levels may protect against breast and endometrial cancer in women.

The combination of the 2007 Global Report with additional peer-reviewed and validated research regarding the association between physical activity and cancer prevention has led to three points of consensus, specifically that regular, moderate-to-vigorous physical activity is (Courneya & Friedenreich, 2007; World Cancer Research Fund, 1997):

- Convincingly associated with a reduced risk of colon and breast cancer (of undefined menopausal status) (World Cancer Research Fund, 1997)¹¹;
- Probably associated with a reduced risk of endometrial cancer and post-menopausal breast cancer; and,
- Suggestively associated with a reduced risk of premenopausal breast, prostate and lung cancer.

A brief review of the associations of physical activity with each of these cancers is detailed below.

Colon Cancer

Physical activity has been convincingly proven to reduce the risk of colon cancer; results vary from a 35% average risk reduction among physically active and a 60% increase in risk among sedentary individuals (Lee, 2003). A range of 30 to 60 minutes per day of moderate to vigorous physical activity, occurring in both recreational and occupational settings, can reduce the risk of colon cancer in both men and women by an estimated 24% (Pate et al., 1995; Wolin, Yan, Colditz, & Lee, 2009; World Cancer Research Fund & American Institute for Cancer Research, 2007). Physical activity also protects against many of the biological mechanisms that are associated with colon cancer and that are related to maintaining a healthy weight, including: insulin resistance; body fatness; effected endogenous steroid hormone metabolism; and reduced gut transit time(World Cancer Research Fund & American Institute for Cancer Research, 2007).

¹¹ The 2007 Global Report reviewed 6 studies that demonstrated how, not specifying menopausal status, physical activity can convincingly decrease the risk of breast cancer.

Breast Cancer

The evidence for breast cancer risk and physical activity includes research findings that, based on study design and methodological considerations, demonstrate different risk linkages based on menopause status. As such, it has been demonstrated that physical activity has convincing linkages to a decreased risk of breast cancer (menopause status unspecified), probable linkages to post-menopausal breast cancer and limited-to-suggestive linkages to pre-menopausal breast cancer.

Women who are physically active can reduce their risk by 20% to 40%, while those who are sedentary may increase their risk to upwards of 90% (Friedenreich & Orenstein, 2002; Friedenreich & Cust, 2008; Lee, 2003). While less data is available to evaluate the relative risk for pre-menopausal women, some research suggests that there may be modest protective effect (Monninkhof et al., 2007). The amount of physical activity needed to reduce breast cancer risk varies between research studies; most posit that at least 4 hours per week of moderate to vigorous activity is required (Hardman, 2001; Thune & Furberg, 2001). In terms of dose response, each additional hour of physical activity per week has been associated with a 6% decrease in breast cancer risk (Monninkhof et al., 2007). Similar to colon cancer, the biological mechanisms associated with breast cancer that physical activity protects against are related to healthy weights and include an effect on body fatness and steroid hormone metabolism, as well improved insulin sensitivity (Neilson, Friedenreich, Brockton, & Millikan, 2009; World Cancer Research Fund & American Institute for Cancer Research, 2007).

Endometrial Cancer

Physical activity is probably associated with risk of endometrial cancer; results indicate an average risk reduction of 30% to 40% among moderately physically active women (Friedenreich & Orenstein, 2002). A recent meta-analysis indicates that moderate to vigorous physical activity for at least 60 minutes per day, three-to-four times per week can have a significant reduction effect (Cust, Armstrong, Friedenreich, Slimani, & Bauman, 2007).

Other Cancer Sites

For the other types of cancer that are prevalent in Alberta, including lung and prostate cancer, more research is needed to examine their associations with physical activity. Currently, evidence demonstrating that physical activity decreases the risk of these cancer types is limited and only suggestive. Both the Health Professionals Follow-Up Study and the American Cancer Society Cancer Prevention Study (Nutrition II cohort) found that high levels of physical activity were associated with a decreased risk of aggressive prostate cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007). More

research is necessary to determine whether a relationship exists between physical activity and overall prostate cancer, and this represents an important area for future work given the high incidence of prostate cancer in Alberta.

Physical Activity and the Risk of Type 2 Diabetes

The findings of multiple prospective cohort studies (including the Nurses' Health Study, Health Professionals Follow-up Study, Women's Health Study, Iowa Women's Health Study, Physicians Health Study, and the Women's Health Initiative) consistently support the WHO/FAO conclusion that individuals who are physically active develop impaired glucose tolerance (prediabetes) and type 2 diabetes less often than individuals who live a sedentary lifestyle (Bazzano et al., 2005; Gill & Cooper, 2008; Schulze & Hu, 2005). The risk reduction in type 2 diabetes that is associated with physical activity in these studies generally ranges from 25% to 35% (Bazzano et al., 2005; Gill & Cooper, 2008; Kruk, 2007). The risk reduction in type 2 diabetes that is associated with physical activity may be greater in higher risk populations (e.g. people with a family history of diabetes, excess weight, pre-diabetes or the metabolic syndrome) than lower risk population (e.g. normal weight individuals with no family history of diabetes); however, this observation has been somewhat inconsistent across studies (Bassuk & Manson, 2005; Gill & Cooper, 2008).

Although physical activity contributes to weight maintenance and weight loss (when energy intake is controlled), only part of the beneficial effect of physical activity on type 2 diabetes risk is mediated by body weight (Bassuk & Manson, 2005; Gill & Cooper, 2008).

Physical activity is also associated with improvements in insulin sensitivity in people with and without type 2 diabetes, and consequently is beneficial in both the prevention and treatment of type 2 diabetes and prediabetes (Bassuk & Manson, 2005; Parillo & Riccardi, 2004; Schulze & Hu, 2005). Thus, the protective effect of physical activity for type 2 diabetes is independent of BMI or adiposity (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Physical Activity and the Risk of Cardiovascular Disease

The association between physical activity and the risk of cardiovascular disease (CVD) is unique compared to cancer and diabetes because of the associations cardiovascular and respiratory fitness have with overall CVD risk. Combined in a single definition, cardio-respiratory fitness refers to the ability of the circulatory and respiratory systems to supply an individual's skeletal muscles with oxygen (Donatelle, 2008). With this definition in mind, research has demonstrated that consistent physical activity of moderate-to-vigorous intensity is an important

determinant of cardiovascular and respiratory fitness, because it can strengthen both the circulatory and respiratory systems, and enlarge the heart muscle for effective blood flow to working muscles (Donatelle, 2008). Evidence also demonstrates that those who have high to moderate cardio-respiratory fitness levels and are consistently active are likely to have an even lower risk of CVD than those who are physically fit but inactive or sedentary (Eaton et al., 1995; Gill & Cooper, 2008; Hein, Suadicani, & Gyntelberg, 1992). Further, being physically active on a regular basis will help to contribute to a state of physical fitness that can have a greater protective effect against both CVD and IHD risk overall and as well as against individual risk factors such as body fatness, hypertension and high cholesterol than physical activity alone (Eaton et al., 1995). A qualification to this is that physical fitness is best achieved as early as possible in the life course and needs to be maintained, with consistent physical activity, to have the lowest possible risk of CVD (Eaton et al., 1995). The promotion of physical activity maintained over the life course is also important in childhood and youth development to prevent premature cardiovascular disease (Raitakari et al., 1997).

Vigorous physical intensity, however, may be a cardiovascular hazard. In the British Regional Heart Study, men who were mostly vigorously active were also more likely to develop either hypertension or coronary heart disease (CHD) than men who were mostly moderately active (Shaper, Wannamethee, & Weatherall, 1991). This finding suggests that being consistently physically active at the highest intensity level strains the heart muscle, leading to elevated blood pressure and increased risk of CHD (Wannamethee & Shaper, 2001). Accordingly, extensive evidence indicates that moderate activities are sufficient enough to reduce the risk of all cardiovascular diseases and specifically CHD by 40 to 50% (Wannamethee & Shaper, 2001). Physical activity is also associated with a marked decrease in cardiovascular-related and all-cause mortality for both men and women with reported risk reductions in the range of 20% to 50% (Nocon et al., 2008),

Currently, more research is required to examine the benefits of physical activity for the secondary prevention and management of cardiovascular diseases (Nocon et al., 2008). While physical activity is often suggested to be beneficial for the management of pre-existing CVDs, the independent effects of activity and exercise have not been well-established (Nocon et al., 2008; O'Connor et al., 1989). In contrast, the associations between the management of CVD and comprehensive cardiac rehabilitation, where physical activity is light-to-moderate and an integrated component of a broader patient-focused strategy, are well-established (Canadian Association of Cardiac Rehabilitation (CACR), 2009; Wannamethee & Shaper, 2001; Wannamethee & Shaper, 2002).

Weight Management

Introduction

Poor nutrition and physical inactivity, as modifiable chronic disease risk factors, are intricately related to the maintenance of a healthy body weight. A healthy body weight can be maintained by achieving energy balance, which occurs when the calories an individual consumes from food are equal to those he or she expends through daily activity and metabolism. In contrast, positive energy imbalance occurs when the calories an individual consumes are in excess of those he or she expends. If maintained over time, positive energy imbalance will lead to weight gain. In the sense that obesity is the product of behaviours related to nutrition and physical activity, it can be viewed as a disease in itself. However, in this current situational analysis, obesity is characterized as a risk factor rather than a disease. While there is disagreement on whether obesity should be considered a disease or a risk factor (Heshka & Allison, 2001), the choice to highlight obesity as a risk factor was made in order to demonstrate the substantial impact that body weight, a single health indicator, has on the major chronic diseases in Alberta. Additionally, excess weight on its own is not always associated with impairments, so characterizing it as a risk factor allows this work to consider the probabilistic nature of health outcomes that are associated with obesity (Heshka & Allison, 2001).

Maintaining a healthy weight throughout life may be one of the most important ways to protect against cancer, type 2 diabetes, and cardiovascular diseases. There are, however, numerous social, economic, and political factors to consider, that have led to the creation of 'obesogenic' or overweight and obesity-inducing environments (Raine, 2005). These environments, by their nature, are highly complex and can negatively affect the quality and quantity of an individual's life by restricting their ability to maintain a healthy weight.

The World Health Organization (WHO) defines overweight and obesity as abnormal or excessive overall fat accumulation that presents a risk to an individual's health status (World Health Organization, 2003). An individual's body weight and their risk of cancer, type 2 diabetes, and cardiovascular disease have a positive association such that as weight increases, so does disease risk. Accordingly, individuals who are overweight and obese are likely to have a higher risk of cancer than others who are a normal weight (World Cancer Research Fund & American Institute for Cancer Research, 2007).

Body Mass Index (BMI)

The relationship between weight and health risks is generally determined using a body mass index (BMI) score, which is calculated by dividing an individual's weight in kilograms by their height in metres squared (kg/m^2). Once the BMI calculation is performed, the score is then grouped into one of four main scoring categories, which are distributed as follows:

- Underweight: below $18.5 \text{ kg}/\text{m}^2$, an individual is considered to be underweight;
- Normal weight: 18.5 to $24.9 \text{ kg}/\text{m}^2$, an individual is considered to be of a normal and healthy weight;
- Overweight: 25 to $29.9 \text{ kg}/\text{m}^2$, an individual is considered to be overweight and at increased risk of health problems; and,
- Obese: $30 \text{ kg}/\text{m}^2$ or above, an individual is considered to be obese and can be grouped into three respective classes of obesity, each with its own set of health consequences that vary by severity (World Cancer Research Fund & American Institute for Cancer Research, 2007).

BMI is widely regarded to provide a reliable population health evaluation measure of overall body fatness and to be the best means of weight-impact measurement available for face-to-face, physician-to-patient medical examinations¹². Noted limitations of the BMI, however, are that: (i) individuals are not always accurate in reporting their height and weight; (ii) the BMI is limited in its ability to accurately account for uncommonly muscular and lean individuals and weight distribution differences between adults and children; and (iii) the BMI cut-offs for overweight and obesity may vary for different ethnic groups. In combination with other weight-impact assessment tools, such as the waist-circumference test, the waist-to-hip ratio, and the body fat skin-fold test, the BMI can be effectively used to determine how an individual's weight contributes to their overall health status (Institute of Medicine, 1995).

'Apples & Pears'

In most cases, body fat is not distributed equally around the body and fat stores are likely to be dispersed in different regions of the body based on genetic factors. Peripheral fat stores are those that are distributed 'not around the trunk' and can be used to measure total body fatness. By comparison, abdominal adiposity or central fat stores are those which are distributed in the mid-section and can be estimated by measuring an individual's waist circumference or calculating their waist-to-hip ratio. In terms of gender, men are more likely to store fat around their abdominal regions, producing an apple

¹² Here weight-impact measurement refers to how at risk an individual is for developing common weight-related illnesses or "co-morbidities" such as diabetes, arterial hypertension, and high cholesterol, amongst others.

shape; women, in turn, tend to store their highest concentrations of fat around their hips, buttocks and thighs, producing a pear shape (Figure 3.3). How fat-stores are distributed on the body and how weight constituted by fat is gained throughout the life course, especially in adulthood has been shown to have a significant effect on the development of specific types of cancer in certain areas of the body (Institute of Medicine, 1995).

Figure 3.3 - A Visual Example of Fat Stores (Apples & Pears) for Men and Women (Dummies.com, 2009)



Waist Circumference

Waist circumference (WC) is another indicator of weight-related health outcomes. The waist circumference measure provides an approximate index of intra-abdominal fat mass and total body fat (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). As an indicator of abdominal obesity, WC is equally effective for predicting type 2 diabetes risk as more complex indicators, such as waist hip ratio, iliac circumference, or intra-abdominal fat area (Freemantle, Holmes, Hockey, & Kumar, 2008). This finding demonstrates that the relatively simple measurement of WC can be used to identify individuals or proportions of the population at increased risk of type 2 diabetes. Both body mass index (BMI) and waist circumference (WC) have also been used to establish positive associations between body weight and fat distribution with the risk of cardiovascular disease as well as its risk factors, particularly hypertension and high cholesterol (Han, van Leer, Seidell, & Lean, 1995). As a risk factor for cardiovascular disease, independently, and for other risk factors related to CVD, the effects of hypertension can be prevented, reduced and/or managed through effective weight loss and management (S. Klein et al., 2004b). Essentially, the more weight an overweight or obese person loses, the greater improvement they will experience in their blood pressure (S. Klein et al., 2004b).

The National, Heart, Lung and Blood Institute (NHLBI) also classify the risk of obesity related diseases such as heart disease, type 2 diabetes and colorectal cancer as high if: men have a waist circumference greater than 102 cm (40 in), and women have a waist circumference greater than 88 cm (35 in) (National

Heart, Lung, and Blood Institute (NHLBI), unknown). Moreover, in 2007 a meta-analysis of 15 prospective studies, that included 258,114 participants with 1,520,864 person-years of follow-up, demonstrated that the risk of cardiovascular disease increases among both men and women with elevations in their WC and waist-to-hip ratio (WHR) (de Koning, Merchant, Pogue, & Anand, 2007). Specifically, a 1 cm increase in WC is associated with a 2% increase, while a 0.01 increase in WHR is associated with a 5% increase in risk of future CVD after adjusting for age and cohort characteristics (de Koning et al., 2007). However, further research disputes this correlation between CVD risk and WHR, proposing that a large hip circumference is likely to have a protective effect and reduce the risk of CVD and IHD in women, while having no protective effect on cardiovascular health in men (Heitmann, Frederiksen, & Lissner, 2004; Schneider et al., 2007).

The interpretation of the waist circumference measure is likely to differ among individuals of different ethnic origin. The upper WC measurement cutoff for individuals to experience an increased risk of developing health problems is higher for both men and women among European (Caucasian), Sub-Saharan African, Eastern Mediterranean, and Middle Eastern descent than individuals of South Asian, Malaysian, Asian, Indian, Chinese, Japanese, South and Central American descent (Heart and Stroke Foundation of Canada, 2009a).

Figure 3.4 - Waist Circumference Cutoffs for an Increased Risk of Developing Health Problems, by Gender and Ethnicity (Heart and Stroke Foundation of Canada, 2009a)

Ethnic Background	Cutoff for Males	Cutoff for Females
European (Caucasian)	102 cm or 40 inches	88 cm or 35 inches
Sub-Saharan African		
Eastern Mediterranean		
Middle Eastern		
South Asian	90 cm or 35 inches	80 cm or 32 inches
Malaysian		
Asian		
Indian		
Chinese		
Japanese		
South American		
Central American		

The Association between Excess Weight and Chronic Disease

The associations between excess weight and an increased risk for the chronic diseases of are well-established. For example, there is convincing evidence that:

- Body fatness (overweight and obesity) is convincingly associated with an increased risk of oesophagus, pancreatic, colorectal, breast (postmenopausal), endometrial, and kidney cancers (World Cancer Research Fund & American Institute for Cancer Research, 2007);
- Excess body weight is the most important risk factor for type 2 diabetes, and both the degree of overweight and obesity (as measured by the BMI) and the distribution of body weight (as measured by the WC) contribute to diabetes risk (Alberti et al., 2007; Parillo & Riccardi, 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).
- Controlling for other CVD risk factors including age, alcohol consumption, tobacco use and physical activity, the greater the BMI and WC a person has, the more likely they will have hypertension and cholesterol, and the more at risk they will be for developing a cardiovascular disease (Heitmann et al., 2004; World Cancer Research Fund & American Institute for Cancer Research, 2007).

Probable evidence also exists that: body fatness probably increases the risk of gallbladder cancer; abdominal fatness probably increases the risk of pancreatic, breast (postmenopausal), and endometrial cancer; and, adult weight gain probably increases the risk of breast (postmenopausal) cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007). While obesity has been convincingly proven to increase the risk of specific diseases, the effects of weight-related factors are different for each illness. For instance, in the WCRF / AICR Global Report, only one instance demonstrates how body fatness probably reduces the risk of cancer, specifically for breast cancer risk among premenopausal women (World Cancer Research Fund & American Institute for Cancer Research, 2007).

Research also suggests that all three illnesses are involved in a continuous relationship where the risk of an individual developing any of the diseases is greater with increases in his or her BMI, waist circumference (WC), and waist-hip ratio (WHR) measurement (Parillo & Riccardi, 2004; Schulze & Hu, 2005; Steyn et al., 2004; World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). This relationship was examined in a 2009 meta-analysis of 89 relevant cohort studies that calculated the pooled relative risks for the associations between BMI, WC and the

incidence of 20 weight-related co-morbidities (Guh et al., 2009). The results of the study demonstrated that a BMI or WC classified as overweight and obese is associated with an increased risk of developing type 2 diabetes, coronary artery disease, congestive heart failure, hypertension, pulmonary embolism, stroke, and multiple types of cancer, amongst other illnesses (Figure 3.5) (Guh et al., 2009).

Figure 3.5 - Relative Co-Morbidity Risks Related to Being Overweight or Obese (Guh et al., 2009).

Co-morbidity	Measure	Overweight (WC≥80cm) (BMI 25-29.9 m/kg ²)		Obesity (WC≥88cm) (BMI ≥ 30.0 m/kg ²)	
		Male	Female	Male	Female
Cancer					
Breast, Postmenopausal	BMI		1.08 (1.03 – 1.14)		1.13 (1.05 – 1.22)
Colorectal	BMI	1.51 (1.37 – 1.67)	1.45 (1.30 – 1.62)	1.95 (1.59 – 2.39)	1.66 (1.52 – 1.81)
Endometrial	BMI		1.53 (1.45 – 1.61)		3.22 (2.91 – 3.56)
Esophageal	BMI	1.13 (1.02 – 1.26)	1.15 (0.97 – 1.36)	1.21 (0.97 – 1.52)	1.20 (0.95 – 1.53)
Kidney	BMI	1.40 (1.31 – 1.49)	1.82 (1.68 – 1.98)	1.82 (1.61 – 2.05)	2.64 (2.39 – 2.90)
Ovarian	BMI		1.18 (1.12 – 1.23)		1.28 (1.20 – 1.36)
Pancreatic	BMI	1.28 (0.94 – 1.75)	1.24 (0.98 – 1.56)	2.29 (1.65 – 3.19)	1.60 (1.17 – 2.20)
Prostate	BMI	1.14 (1.00 – 1.31)		1.05 (0.85 – 1.30)	
Type 2 Diabetes					
	BMI	2.40 (2.12 – 2.72)	3.92 (3.10 – 4.97)	6.47 (5.55 – 8.19)	12.91 (9.03 – 17.06)
	WC	2.27 (1.67 – 3.10)	3.40 (2.42 – 4.78)	5.13 (3.81 – 6.90)	11.10 (8.23 – 14.96)
Cardiovascular Diseases					
Hypertension	BMI	1.28 (1.10 – 1.50)	1.65 (1.24-2.19)	1.84 (1.51-2.24)	2.42 (1.59-3.67)
	WC	NA	1.38 (1.27 – 1.51)	NA	
Coronary Artery Disease	BMI	1.29 (1.18-1.41)	1.80 (1.64-1.98)	1.72 (1.51-1.96)	3.10 (2.81-3.43)
	WC	1.41 (1.16-1.72)	1.82 (1.41-2.36)	1.81 (1.45-2.25)	2.69 (2.05-3.53)
Congestive Heart Failure	BMI	1.31 (0.96-1.79)	1.27 (0.68-2.37)	1.79 (1.24-2.59)	1.78 (1.07-2.95)
Pulmonary Embolism	BMI	1.91 (1.39-2.64)	1.91 (1.39-2.64)	3.51 (2.61-4.73)	3.51 (2.61-4.73)
Stroke	BMI	1.23 (1.13 – 1.34)	1.15 (1.00-1.32)	1.51 (1.33-1.72)	1.49 (1.27-1.74)
Other Illnesses					
Asthma	BMI	1.20 (1.08-1.33)	1.25 (1.05 – 1.49)	1.43 (1.14-1.79)	1.78 (1.36-2.32)
Gallbladder Disease	BMI	1.09 (0.87-1.37)	1.44 (1.05-1.98)	1.43 (1.04-1.96)	2.32 (1.17-4.57)
	WC	1.61 (1.40-1.85)	NA	2.38 (2.06-2.75)	NA
Osteoarthritis	BMI	2.76 (2.05-3.70)	1.80 (1.75-1.85)	4.20 (2.76-6.41)	1.96 (1.88-2.04)
Chronic Back Pain	BMI	1.59 (1.34-1.89)	1.59 (1.34-1.89)	2.81 (2.27-3.48)	2.81 (2.27-3.48)

Of particular interest within the 2009 meta-analysis:

- Type 2 diabetes demonstrated the largest risk association of any the co-morbidities examined for both overweight and obesity. Overweight was associated with a 2.3-3.9 times greater risk of developing type 2 diabetes, while a BMI or WC classified as obese was associated with a 5.1-12.4 greater risk of developing type 2 diabetes. While excess body weight is associated with increased risk of type 2 diabetes among males and females, this meta-analysis suggests that the magnitude of risk is greater among females (Guh et al., 2009).
- Among the various cancer sites, colorectal and kidney cancer were identified to have the largest risk associations with being overweight among men (putting them at a 1.51 times greater risk) and women (putting them at a 1.82 times greater risk), respectively. Further, obesity was associated most with endometrial cancer among women and pancreatic cancer.
- Comparing the different cardiovascular diseases, pulmonary embolism demonstrated the largest risk association for both overweight and obesity, increasing the risk by 1.91 times and 3.51 times, respectively. Following closely, coronary artery disease demonstrated the second largest risk association among cardiovascular diseases for both excess weight statuses.

Further details about the relationships between excess body weight and the risk of developing multiple types of cancer, type 2 diabetes, and cardiovascular disease are provided below:

Excess Body Weight and the Risk of Cancer

Similar to other meta-analyses conducted in relevant fields, the WCRF/AICR Global Report's systematic review of research literature pertaining to body composition, growth, and development found that the relationship between body fatness and the risk of cancer is continuous across the range of BMI. This means that as BMI scores increase, cancer risk does as well. While obesity has been convincingly proven to increase the risk of specific cancers, the effects of weight-related factors are different for each type. In the Global Report, only one instance demonstrates how body fatness probably reduces the risk of cancer, specifically for breast cancer risk among premenopausal women (World Cancer Research Fund & American Institute for Cancer Research, 2007). An overview of the WCRF/AICR synthesized evidence for different cancer types is provided below, followed by a summary in [Figure 3.6](#).

Colorectal Cancer

Evidence has shown that abdominal obesity, as measured by waist circumference or waist-to-hip ratio, has stronger associations to colon cancer in both men and women than overall obesity as measured by BMI (T. Pischon et al., 2006). The exact biomarkers that are triggered by both types of obesity that lead to the development of colon cancer are still somewhat unclear, but increased circulating estrogens and decreased insulin sensitivity likely contribute to this process (T. Pischon, Nöthlings, & Boeing, 2008; World Cancer Research Fund & American Institute for Cancer Research, 2007). To date, research has also found that there are no significant risk associations between rectal cancer and body weight.

Breast Cancer

Both overall and abdominal obesity have been linked to an increased risk of post-menopausal breast cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007). An examination of the biomarkers that increase the risk has shown that female sex hormones, growth factors, and other hormones that develop with weight gain may be responsible for this increased risk (World Cancer Research Fund & American Institute for Cancer Research, 2007). Surprisingly, the risk of premenopausal cancer is slightly decreased by the addition of excessive body fat and obesity, despite these factors having other potential negative health implications (World Cancer Research Fund & American Institute for Cancer Research, 2007). This difference in the pattern of associations between pre- and postmenopausal breast cancer and BMI is largely explained by the relationship between breast cancer and endogenous sex hormone levels, with a number of potential mechanisms having been proposed (World Cancer Research Fund & American Institute for Cancer Research, 2007).

Endometrial Cancer

It is estimated that adult obesity is responsible for 40% of all cases of endometrial cancer and the addition of excess weight can increase its risk by 2 to 3 times compared to an individual of normal weight (Bergstrom, Pisani, Tenet, Wolk, & Adami, 2001). Compared to other cancer types, endometrial cancer has the clearest threshold effect, meaning that its risk increases significantly when an individual's BMI increases from the overweight to obese range. In terms of its biomarkers, the risk of endometrial cancer may be linked to alterations in an individual's endogenous hormone metabolism caused by excess weight (Kaaks, Lukanova, & Kurzer, 2002).

Other Cancer Sites

Body weight and obesity - both overall and abdominal - have been linked to other types of cancer. Although what has been established is that while significant risk associations exist for other cancer types and obesity as measured by the BMI, similar associations do not exist when an abdominal obesity measurement tool is used, or vice versa. For example:

- **Esophageal Cancer (adenocarcinoma):** Convincing evidence supports a relationship between body fatness, as measured by BMI, and esophageal adenocarcinoma (World Cancer Research Fund & American Institute for Cancer Research, 2007). There is evidence to support a dose-response relationship, estimated at an increased risk of esophageal adenocarcinoma for every 5kg/m² increase in BMI.
- **Gallbladder Cancer:** Body fatness, measured by BMI, is a probably associated with an increased risk of gallbladder cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007).. In addition to the direct relationship between body fatness and gallbladder cancer, body fatness is also associated with increased risk of developing gallstones, which further increases the risk of gallbladder cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007).
- **Renal Cell Cancer:** The WHO has validated results demonstrating a significant relationship between the BMI, body weight and risk of renal cell cancer (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). By comparison, the association between body fat distribution and renal cell cancer is still inconclusive due to limited research. Biological linkages also exist between obesity and an increased risk of hypertension and diabetes, which are key risk factors for renal cell cancer (Chow, Gridley, Fraumeni, & Jarvholm, 2000).
- **Pancreatic Cancer:** Insufficient evidence exists for the association between BMI-measured obesity and the risk of pancreatic cancer (Giovannucci & Michaud, 2007); in contrast, strong evidence exists for the positive risk association for abdominal obesity as measured by the waist circumference test (Patel et al., 2005).
- **Prostate Cancer:** An overall significant risk association between prostate cancer and obesity measured using the BMI has yet to be found (World Cancer Research Fund & American Institute for Cancer Research, 2007). Strong risk associations, however, have been found between obesity and a higher risk of advanced-stage fatal prostate cancer and high-grade tumors, but also a decreased risk for low-grade early stage, treatable non-fatal cancer. Biologically, obese individuals can be differentiated in terms of their prostate cancer risk because of

hormonal factors and the growth, maturation and differentiation of their prostate glands (Marker, Donjacour, Dahiya, & Cunha, 2003; Parnes, Thompson, & Ford, 2005).

The associations between body weight and cancer, as identified by the WCRF/AICR panel in the 2007 globale report are summarized in [Figure 3.6](#).

Figure 3.6 – Body Fatness, Abdominal Fatness, Adult Weight Gain, and the Risk of Cancer

	Decreases Risk		Increases Risk	
	Exposure	Cancer Site	Exposure	Cancer Site
Convincing	N/A	N/A	Body Fatness	Oesophagus Pancreas Colorectum Breast (postmenopause) Endometrium Kidney
			Abdominal Fatness	Colorectum
Probable	Body Fatness	Breast (premenopause)	Body Fatness	Gallbladder
			Abdominal Fatness	Pancreas Breast (postmenopause) Endometrium
			Adult Weight Gain	Breast (postmenopause)
Limited-Suggestive			Body Fatness	Liver
			Lower Body Fatness ¹³	Lung

Excess Body Weight and the Risk of Type 2 Diabetes

Excess body weight is the most important risk factor for type 2 diabetes (Alberti et al., 2007; Parillo & Riccardi, 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). The WHO/FAO (2003) concluded that the evidence linking excessive weight gain and central adiposity to increased risk of developing diabetes is convincing (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). As indicated above, large-scale, prospective cohort studies have repeatedly demonstrated a continuous and graded relationship between increasing BMI, waist circumference (WC), waist-hip ratio (WHR) and increased risk of type 2 diabetes ([Figure 3.5](#)) (Guh et al., 2009; Parillo & Riccardi, 2004; Steyn et al., 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). It has been estimated that if

¹³ Smoking, recognized by Alberta Health Services' Cancer Prevention Program as a principal cause of lung cancer, may be associated with lower BMI. With that stated, however, the Global Report notes that "there is no known mechanism through which greater body fatness could plausibly protect against lung cancer, or through which low body fatness could increase risk." World Cancer Research Fund / American Institute for Cancer Research (2007). *Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective*. Washington, DC: AICR. pp.225

the prevalence of overweight and obesity in the population were reduced to zero, 80% of type 2 diabetes cases would be avoided.

In addition to the association described here and in the sections above, further evidence on the relationship between body weight and type 2 diabetes comes from several randomized controlled trials. These trials, described in greater detail below, investigated the effects of weight loss, achieved through changes in diet and physical activity behaviours, on the risk of type 2 diabetes in high risk populations.

The prevention of type 2 diabetes in high risk populations: Evidence from randomized controlled trials

The evidence presented above comes primarily from large-scale, prospective cohort studies. Results from this observational research can be generalized to the broader population with a relatively high level of confidence; however, the potential existence of unknown confounding variables is also a disadvantage of such study designs. Randomized trials investigating the effects of lifestyle interventions for the prevention of type 2 diabetes have been completed only among people with pre-diabetes (impaired glucose tolerance or impaired fasting glucose). While this evidence cannot necessarily be generalized to the population at large because it included only high-risk individuals, the randomized study design minimizes the likelihood that confounding variables influence the observed associations.

This section briefly reviews the experimental evidence on the relationships between diet, physical activity, body weight and type 2 diabetes. Interestingly, this research demonstrates that lifestyle interventions targeting the risk factors associated with diabetes risk in the general population also prevent or substantially delay the onset of diabetes in populations at higher risk of type 2 diabetes.

The intervention-based studies most often cited in reviews on the prevention of type 2 diabetes through lifestyle modification include (Alberti et al., 2007; Parillo & Riccardi, 2004; Pi-Sunyer, 2007; Schulze & Hu, 2005; Steyn et al., 2004):

- The Da Qing Study: This study included 577 Chinese subjects with impaired glucose tolerance and a mean age of 45 years. After the 6 year study duration, the incidence of type 2 diabetes was 42% lower among individuals randomized to the diet and exercise intervention compared to the placebo group (Pan et al., 1997).
- The Finnish Diabetes Prevention Study: This study included 522 subjects aged 40-65 who were overweight or obese with impaired glucose

tolerance. After the 3.2 year intervention period, the incidence of diabetes was 58% lower among individuals randomized to the lifestyle intervention compared with the placebo group. Weight loss, increased physical activity, reduced total and saturated fat and increases in fibre all contributed to this risk reduction (Tuomilehto et al., 2001). The effects of this intervention were sustained over 7 years of total follow-up, during which the incidences of type 2 diabetes among the intervention group and the placebo group, respectively, were 4.3 and 7.4 cases per 100 person years. The intervention group had a 43% lower relative risk of developing type 2 diabetes compared to the placebo group during this time frame (Lindström et al., 2006).

- The US Diabetes Prevention Program: This study included 3243 adults with impaired glucose tolerance or impaired fasting glucose who were randomized to placebo treatment, intervention with metformin (an insulin sensitizing agent), or an intensive lifestyle intervention. After the 2.8 year study duration, the incidence of diabetes was 58% lower among individuals in the lifestyle modification group, and 31% among individuals in the metformin group compared to the placebo group (Knowler et al., 2002). After 10 years of follow-up, the cumulative incidence of diabetes remained 34% among those randomized to lifestyle modification and 18% lower among those randomized to take metformin when compared to the placebo group (Diabetes Prevention Program Research et al., 2009).

These trials used similar lifestyle interventions that were generally intended to produce weight loss (in overweight or obese subjects) through dietary modification (moderate calorie restriction, reduction in fat intake, increase in vegetable consumption), and an increase in physical activity (generally, 30-40 minutes of moderate activity on most days) (Alberti et al., 2007). Based on the findings of these studies, the risk of developing type 2 diabetes can be significantly reduced (likely by 50-60%) through improvements in diet, physical activity and body weight among high risk individuals (Steyn et al., 2004). While this quantitative estimate cannot necessarily be generalized to the population at large, the experimental evidence suggests that modifiable risk factors for type 2 diabetes are the same among high and lower risk groups. Additionally, given the high population prevalence of excess weight among Albertans (60.9% in 2004) and the strong association between excess body weight and the development of type 2 diabetes, a significant number of Albertans are at increased risk of developing type 2 diabetes. Lifestyle interventions, such as those included in the RCTs described above, are likely to effectively decrease the risk of developing type 2 diabetes and its associated co-morbidities for a significant number of Albertans.

Excess Body Weight and the Risk of Cardiovascular Disease

Obesity adversely affects cardiac function, increases the impact of mediating risk factors for coronary heart disease, and is an independent risk factor for cardiovascular disease. As a medical condition, obesity is associated with an increase in total blood volume and cardiac output which, simplistically, puts additional strain on the heart and can decrease the strength of cardiac muscles. In the Framingham Heart Study, the relationship between obesity and the incidence of cardiovascular disease was examined among the 5,209 men and women of the original cohort recruited in 1948. Results of the study indicate that obesity is a significant independent predictor of CVD, ischemic heart disease, stroke and congestive heart failure, particularly among women (Hubert, Feinleib, McNamara, & Castelli, 1983). Obesity also has demonstrated associations with hypertension, metabolic syndrome and type 2 diabetes (noted above) that are all risk factors for developing a cardiovascular disease (F. B. Hu et al., 2001; Hubert et al., 1983).

Both body mass index (BMI) and waist circumference (WC) have been used to establish positive associations between body weight and fat distribution with the risk of cardiovascular disease as well as its risk factors, particularly hypertension and high cholesterol (Han et al., 1995). Moreover, in 2007 a meta-analysis of 15 prospective studies, that included 258,114 participants with 1,520,864 person-years of follow-up, demonstrated that the risk of cardiovascular disease increases among both men and women with elevations in their WC and waist-to-hip ratio (WHR) (de Koning et al., 2007). Specifically, a 1 cm increase in WC is associated with a 2% increase, while a 0.01 increase in WHR is associated with a 5% increase in risk of future CVD after adjusting for age and cohort characteristics (de Koning et al., 2007). However, further research disputes this correlation between CVD risk and WHR, proposing that a large hip circumference is likely to have a protective effect and reduce the risk of CVD and IHD in women, while having no protective effect on cardiovascular health in men (Heitmann et al., 2004; Schneider et al., 2007).

Other weight-related risk factors for cardiovascular disease include metabolic syndrome and type 2 diabetes (Kip et al., 2004). Both are associated with obesity and are independent risk factors for developing ischemic heart disease and having a myocardial infarction or heart attack (S. Klein et al., 2004a). In fact, diabetes increases the risk of a heart attack by 2.5 times, while cardiovascular diseases account for 65% of diabetes-related mortality (Graham et al., 2007; Grundy et al., 1999). By comparison, metabolic syndrome is characterized by a large waist circumference, insulin-resistant glucose metabolism (related to type 2 diabetes), dyslipidemia (disruption in the amount of lipids - naturally occurring fats, waxes, sterols and fat-soluble vitamins - in the blood), and increased blood pressure (National Cholesterol Education Program

(NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2002). Patients who have the metabolic syndrome have a 1.5- to 3-fold increase in their risk of CHD and stroke (S. Klein et al., 2004b). With weight loss and effective weight management the risk of cardiovascular diseases associated with both metabolic syndrome and diabetes is likely to decrease (S. Klein et al., 2004b).

The Primary Prevention of Cerebrovascular Disease

The primary prevention of cerebrovascular disease is quite similar to the prevention cardiovascular disease. In many ways, proper nutrition, regular physical activity and a healthy body weight that contribute to good cardiovascular health will also cultivate good cerebrovascular health. The Canadian Stroke Network and Heart and Stroke Foundation of Canada propose that the adoption and maintenance of a healthy lifestyle and the management of specific risk factors are the best ways to reduce the risk of an acute ischemic stroke among the entire population (Canadian Stroke Network(CSN) & Heart and Stroke Foundation of Canada (HSFC), 2006). A healthy lifestyle pattern that effectively minimizes the risk of stroke is characterized by (Canadian Stroke Network (CSN) & Heart and Stroke Foundation of Canada (HSFC), 2006):

- Moderate exercise (an accumulation of 30 to 60 min) of brisk walking, jogging, cycling or other dynamic exercise 4 to 7 days each week; as well as, medically supervised exercise programs for high risk patients (e.g., those with heart disease) (G. Hu et al., 2005).
- A diet that is low in fat (especially saturated fat) and sodium, and high in fruit and vegetables.
- No alcohol to moderate consumption (less than two standard drinks per day). Moderate consumption for men equates to less than 14 drinks per week, while women should consume less than 9 drinks per week.
- A body weight within the BMI range of 18.5 to 24.9 kg/m² and a waist circumference of <88 cm for women and <102 cm for men.

According to a meta-analysis of seven studies examining the association between body weight and the risk of ischemic stroke, being overweight (defined by BMI of 25-29.9 m/kg²) is associated with a 1.15 to 1.23 greater risk (RR) and being obese (defined by BMI>30 m/kg²) is associated with a 1.49 to 1.51 greater risk (RR) for having a stroke (Guh et al., 2009). Moreover, there are modifiable lifestyle factors such as tobacco use, poor mental health and hypertension, in addition to non-modifiable factors such as age, sex and heredity that can increase the risk of stroke as well.

Summary and Conclusions

A large proportion of Albertans do not appear to follow current healthy living guidelines with respect to nutrition, physical activity and weight management (See Chapter 4). Generally, most Albertans consume a 'Western' diet, or rather a diet that is generated by industrialized food systems and characterized by energy dense and processed foods, high in meat, refined grains, high-fat and fast foods (World Cancer Research Fund & American Institute for Cancer Research, 2007). The associated health effects of the 'Western' diet are best recognized as overweight and obesity, but there are also major associations with heart disease, diabetes and specific types of cancer including cancers of the colon, breast (post-menopausal), endometrium, kidney, and esophagus (World Cancer Research Fund & American Institute for Cancer Research, 2007). Specific to cancer, the effect of the Western diet seems to be most evident for cancers of the breast and colon, but this is modifiable if the calories an individual consumes, in consideration of the types of food consumed, are kept in balance with the calories he or she expends on a daily basis. When calories consumed are in excess of calories expended, a positive energy imbalance is created, which leads to weight gain, and concomitant increases in risks for multiple chronic diseases.

The evidence presented in this chapter provides an international, multi-contextual perspective on chronic disease prevention and relative risk as it relates to nutrition, physical activity and the maintenance of a healthy body weight. Taken as a whole, it promotes a perspective through which disease prevention efforts can be focused to encompass modifiable risk factors that have both deeply embedded and surface-level social, cultural, economic, and ecological/environmental influences

Applying the convincing and probable findings on nutrition at both the population-health and individual level, Albertans should eat a diet primarily comprised of whole grains, vegetables and fruit, while limiting processed and energy-dense foods and beverages. In terms of physical activity, Albertans should be moderately physically active for at least 30 minutes every day and engaging in regular physical activity to maintain a healthy body weight throughout their lifespan. Moreover, we should also limit our sedentary habits and 'screen time' - watching television, computer work, and videogames – as much as possible.

Moving forward, more research is needed to examine the disease-related risk associations for nutrition, physical activity and weight management so that effective health promotion targets can be generated and put into action. The underlying influences on nutrition, physical activity, and weight-related

behaviours that exist in Alberta should be considered in relation to existing international multidisciplinary evidence so that provincial- and regional-level data can be assessed in relation to validated international standards. Following this consideration, interventions can then be designed, delivered, and evaluated, where appropriate and on an ongoing basis, to improve the overall health of Albertans.

Chapter 4: Recognition and Analysis of Chronic Disease Related Evidence (RACE)

Part 2—A Review of Nutrition and Physical Activity Statistical Indicators

Key Points

- The Canadian Community Health Survey (CCHS), the Alberta Centre for Active Living's Physical Activity Survey, and the Canadian Council of Food and Nutrition's Tracking Nutrition Trends IV Survey reveal that current health behaviours related to nutrition, physical activity and body weight among Albertan adults are not conducive to the prevention of chronic disease.
- Less than one-half of Albertan adults consume 5 or more daily servings of vegetables and fruit, few adults meet daily recommendations for fibre intake, the majority of adults consume excessive amounts of sodium (salt), and approximately one-quarter of adults consume too much saturated fat.
- Approximately one-half of Albertan adults reported being active or moderately active during their leisure time. The prevalence of physical inactivity was higher among older age categories, and Albertans with lower levels of education, and lower total household income.
- Based on measured height and weight data collected during the 2004 CCHS, 60.9% of Albertan adults were overweight or obese (68.8% of men and 52.9% of women). Obesity prevention and control initiatives are needed to address the behavioural, social and environmental factors that contribute to unhealthy weights within the population.

Introduction

It is necessary to understand the existing structures, policies and services that exist in Alberta as a whole in order to improve the nutrition and physical activity health behaviours of all Albertans. The provincial and regional profiles presented here were accomplished through the systematic collection and analysis of relevant information and are designed to provide the Alberta Health Services Public Health Innovation and Decision Support (PHIDS) division and its partners with the evidence required to prioritize, plan and support population health chronic disease prevention programs and interventions. Using the most current evidence (at the time of publication) each profile will incorporate a visual and descriptive presentation of statistical data concerning measurable nutrition and physical activity health behaviours such as fruit and vegetable consumption, leisure-time physical activity, body weight status, and alcohol consumption, amongst others, for Albertans 18 years of age and older.

Key Data Sources and Definitions

The main statistical data source used to create the provincial and regional profiles was the Canadian Community Health Survey (CCHS 4.1, 2007). The CCHS is a cross-sectional nationally-representative survey conducted every 2 years by Statistics Canada to collect information related to health status, health care utilization and other health determinants (Statistics Canada, 2008a). Data from the survey were analyzed by PHIDS, in consultation with our colleagues in the AHS Cancer Care - Surveillance Department

To ensure that the results of the analysis were representative of the province and its former nine Regional Health Authorities (RHAs), weighted results were estimated for Health Region, age, and gender, using the weighting variable provided by Statistics Canada. Weighted estimates were also estimated for specific nutrition and physical activity questions such as vegetable and fruit intake, leisure-time physical activity, and body mass index (BMI) calculations. The proportional estimates presented also do not include “Not Stated” responses, which generally made up an insignificant proportion (i.e., less than 5%) of the sample population.

The CCHS 2007 sampling frames for Canada, Alberta and each of the province's former regional health authorities are as follows (Statistics Canada, 2008a):

- Sampling frame for Canada (n=25,275,976)
- Sampling frame for Alberta (n= 2,584,707)
- Sampling frame for Chinook Health (n = 117,837)
- Sampling frame for Palliser Health Region (n = 78,707)
- Sampling frame for Calgary Health Region (n = 972,088)
- Sampling frame for David Thompson Regional Health Authority (n = 231,254)
- Sampling frame for East Central Health (n = 86,839)
- Sampling frame for Capital Health (n = 819,037)
- Sampling frame for Aspen Regional Health Authority (n = 125,576)
- Sampling frame for Peace Country Health (n = 101,353)
- Sampling frame for Northern Lights Health Region (n = 52,016)

The following sections will profile nutrition, physical activity and weight management behaviours at the provincial and regional levels, including: self-perceived health status; health improvement behaviours; vegetable and fruit consumption; food choices; alcohol consumption; leisure-time physical activity; sedentary behaviours; and actual and perceived weight status. After each profile, brief recommendations for programming and health promotion strategic planning will be provided.

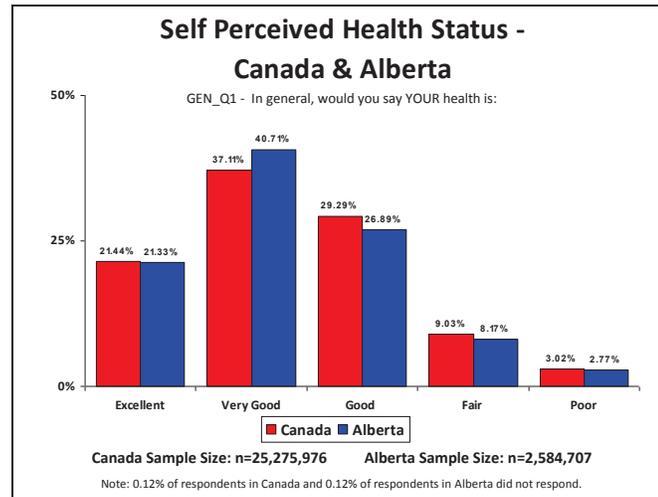
Self-Perceived Health Status

How individuals perceive their health is often highly correlated with how they live their lives, especially in terms of their nutrition, physical activity and weight management behaviours. Perceived health status, as an influence on the uptake of these behaviours, is also thought to be intricately related to chronic disease risk. More research is required to examine the perceived health statuses of individuals at high and low risks, respectively, for specific diseases based on their nutrition and physical activity behaviours.

In general, Albertans' perceptions of their health were fairly consistent with the rest of Canada. There were no evident differences between the populations in how they perceived their health from 'excellent' to 'poor'. The most noticeable difference was that Albertans were more likely to perceive their health as 'Very Good' (40.71%), but this observation is accompanied by a lower proportion who considered themselves to be in 'Good' health (26.89% in Alberta, compared to 29.29% in Canada).

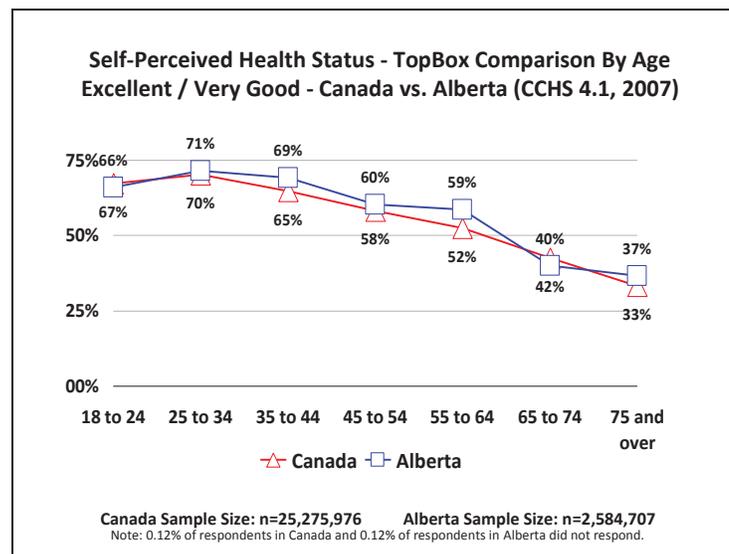
About two-thirds (62.04%) of Albertans aged 18 years and above ranked their health as being 'excellent' or 'very good'. In contrast, only 10.94% ranked their health as being 'fair' or 'poor' (Figure 4.1).

Figure 4.1 - Self Perceived Health Status – Canada and Alberta (CCHS 4.1, 2007)



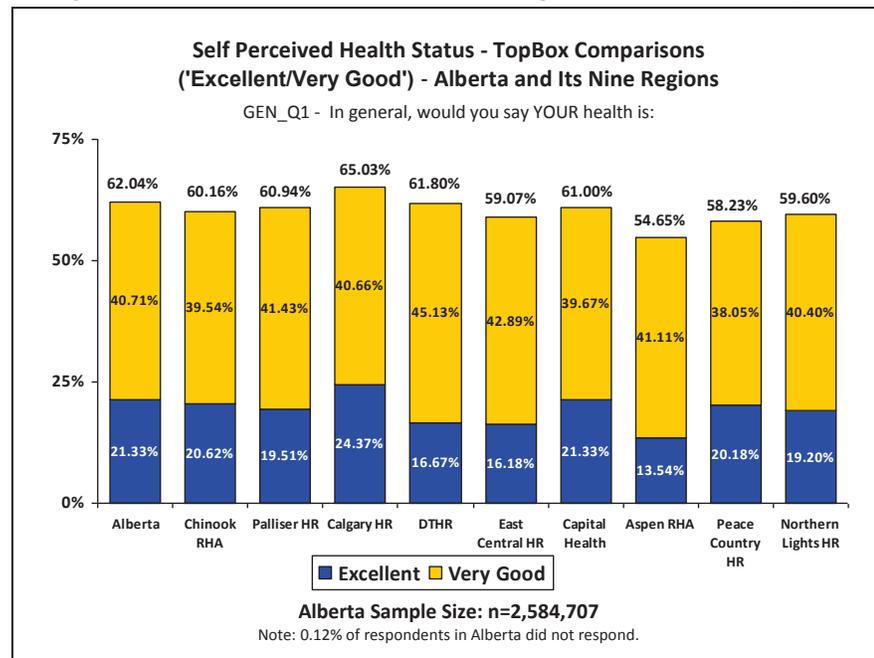
Overall, as Canadians and Albertans grow older they become less likely to perceive their health as ‘excellent’ or ‘very good’. Only slight differences existed between the groups when analysed by age for the perceived health statuses of ‘excellent’ and ‘very good’; the age group with the largest difference is the 55 to 64 year old bracket (Alberta 59%; Canada, 52%). (Figure 4.2)

Figure 4.2 - Self Perceived Health Status – Top Box Comparison (Excellent and Very Good) By Age – Canada and Alberta (CCHS 4.1, 2007)



Across the former nine regional health authorities, the region with the largest proportion of residents who considered their health as ‘excellent’ or ‘very good’ was the Calgary Health Region (65.03%). In contrast, residents of the Aspen Regional Health Authority were least likely to consider their health as either ‘excellent’ or ‘very good’ (54.65%) (Figure 4.3).

Figure 4.3 - Self Perceived Health Status – Top Box Comparison (Excellent and Very Good) – Among Albertans and residents of its Nine Former Regional Health Authorities (CCHS 4.1, 2007)



Demographically, it was observed that (Statistics Canada, 2008a):

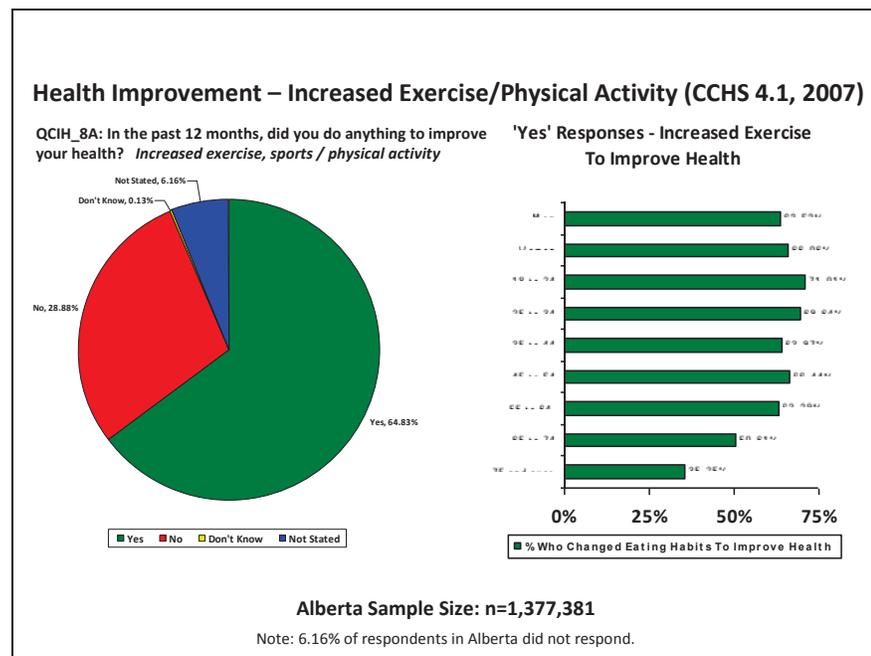
- Albertan women were more likely than men to perceive their health as ‘excellent’ or ‘very good’ (64.2% compared to 59.9%).
- The proportion of respondents who considered their health to be ‘excellent’ or ‘very good’ decreased with age starting in the mid-20s; largest proportion were those 25 to 35 years of age (71.4%), while the lowest proportion was observed among those who were 75 years or older at the time of the survey(36.6%).
- Respondents who graduated from post-secondary education were the most likely to perceive their health as ‘excellent’ or ‘very good’ (66.35%).
- The likelihood to perceive health as ‘excellent’ or ‘very good’ increased with total household income. The largest respondent group to perceive their health as ‘excellent’ or ‘very good’ reported earning \$80,000 or more per year (69.59%).

Health Improvement

An individual changing his or her behaviour to improve their overall health or specific facets of their health behaviour requires a great deal of motivation, time and effort. There are several ways that Albertans try to improve their health in terms of nutrition and physical activity on an annual basis.

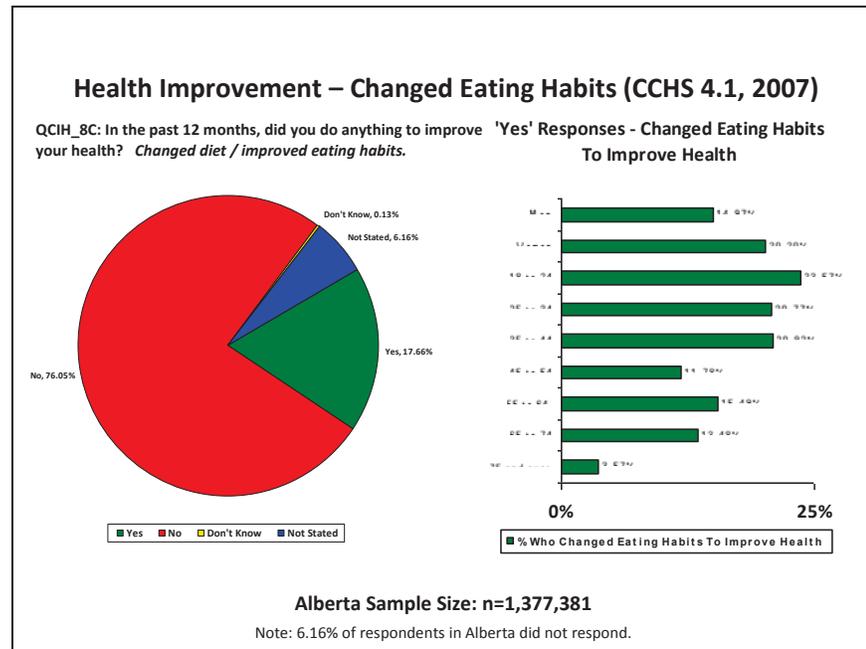
In 2007, more than six-in-ten Albertans reported that they had increased their overall amount of exercise and physical activity in the past 12 months to improve their health (64.83%). Those most likely to change their physical activity behaviour to improve their health were between the ages of 18 and 24 (71.0%) and 25 to 34 (69.6%) (Figure 4.4).

Figure 4.4 – Efforts made by Albertans to Improve Their Health – Increased Exercise / Physical Activity (CCHS 4.1, 2007)



By comparison, two-in-ten Albertans reported that they had changed their eating habits in the past 12 months in order to make a health improvement (17.66%) (Figure 4.5). A higher proportion of women compared to men (20.29% to 14.97%), as well as a large proportion of respondents aged 18 to 24 (23.57%), reported improving their eating habits.

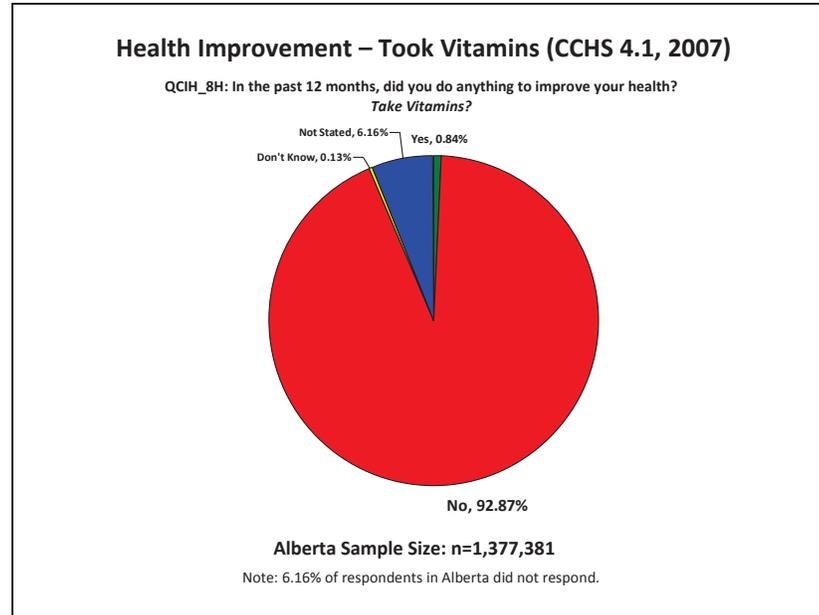
Figure 4.5 – Efforts made by Albertans to Improve Their Health – Changed Eating Habits (CCHS 4.1, 2007)



Very few respondents ($\leq 1\%$) reported that they started taking vitamins and/or minerals to improve their health (Figure 4.6). However, it is recommended that vitamin and mineral supplements be taken to maintain a healthy diet at certain stages during the life-course (World Cancer Research Fund & American Institute for Cancer Research, 2007). For example, the most recent version of Canada’s Food Guide recommends that men and women over the age of 50 should take a daily vitamin D supplement of 10 μg (400 IU) (Health Canada, 2007). Data from the 2004 CCHS also indicates that one-half (48.9%) of Alberta adults reported taking vitamin and/or mineral supplements (Health Canada, 2008). In comparison, 42.1% of Canadian adults reported taking vitamin and/or mineral supplements during this same time period. Overall, Albertan women reported higher use of supplements than men (57.3% compared to 39.2%), while usage also increased with age (Statistics Canada, 2004b)¹⁴. The World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) (2007) both maintain, however, that vitamins and mineral dietary supplements are not recommended for cancer prevention, while further research is required to examine their ability to reduce the risk of other chronic diseases (World Cancer Research Fund & American Institute for Cancer Research, 2007).

¹⁴ Past-month vitamin and mineral supplements consumption, by age group and sex, household population aged 1 and over, .

Figure 4.6 – Efforts made by Albertans to Improve Their Health – Took Vitamins (CCHS 4.1, 2007)



Nutrition

The previous chapter reviewed the multidimensional associations between chronic disease risk and specific nutrition, physical activity and weight management behaviours. In the sections that follow, indicators and corresponding data related to those behaviours within Alberta will be presented.

Nutrition as a modifiable risk factor for disease can be measured in many different ways. For example, evidence suggests that those individuals with the highest intake of vegetables and fruit may benefit from a risk reduction of at least 30% to upwards of 80% for cancer of the upper gastrointestinal tract (e.g., mouth, esophagus and stomach) (World Cancer Research Fund & American Institute for Cancer Research, 2007). However, most Albertans do not consume the recommended 5 to 10 servings of vegetables and fruit per day (discussed below). With the amount and quality of evidence that exists regarding the associations between nutrition and chronic disease, a thorough review of the nutrition behaviours and food choices of Albertans is necessary.

Tracking Nutrition Trends VI – August 2008

The Canadian Council of Food and Nutrition (CCFN) is a national, non-profit organization that aims to provide “trusted, multi-sectoral evidence-based food and nutrition policy and information in Canada.” (Canadian Council of Food and Nutrition (CCFN), 2008) Every two years since 2002, the CCFN has published the results of its Tracking Nutrition Trends (TNT) survey, which investigates the nutrition and food-related attitudes and behaviours of Canadians 18 years of

age or older. Special topics included in the 2008 edition of the survey were an assessment of nutrition knowledge and factors that influence food choices. The most recent TNT survey sampled approximately 2000 Canadians, with specific sampling quotas based on region and gender (n=2003). The sample for Alberta was grouped into an aggregate sample for all Prairie region provinces, including Saskatchewan and Manitoba (n=309).

Results of the 2008 TNT survey indicate that the food choices that people make are undeniably linked to their understanding and knowledge of nutrition. At the national level, 66% of Canadians consider themselves to be somewhat knowledgeable, while only 12% self-report that they are very knowledgeable about nutrition (Canadian Council of Food and Nutrition (CCFN), 2008). Relevant to both heart disease and stroke, eight-in-ten Canadians understand that reducing dietary fat can lower blood cholesterol and are likely to choose foods that are low in trans fat (80%) and made with whole grains (78%)(Canadian Council of Food and Nutrition (CCFN), 2008). In relation to cancer prevention, most Canadians believe that a high fibre diet helps to prevent colon cancer (78%)(Canadian Council of Food and Nutrition (CCFN), 2008). As noted in Chapter 3, the associations between foods containing dietary fibre and a reduced risk of colon cancer are only probable (World Cancer Research Fund & American Institute for Cancer Research, 2007). The level of nutrition knowledge that Canadians have also varies according to sex, age and education.

The factors that influence the food choices of the majority of Canadians include the desire to maintain good health (87%), gain energy and stamina (74%), manage their weight and body image (68%). Moreover, in the 2006 edition of the TNT report, it was demonstrated that only 1 in 4 Canadians (24%) are likely to change their eating habits to reduce their risk of a chronic disease, of which only 6% will make a dietary change to reduce their risk of cancer (4% colon cancer and 2% cancer in general, respectively).

Relying on data from the Canadian Community Health Survey (CCHS 4.1, 2007), the following sections will further examine the vegetable and fruit consumption and food choices of Albertans.

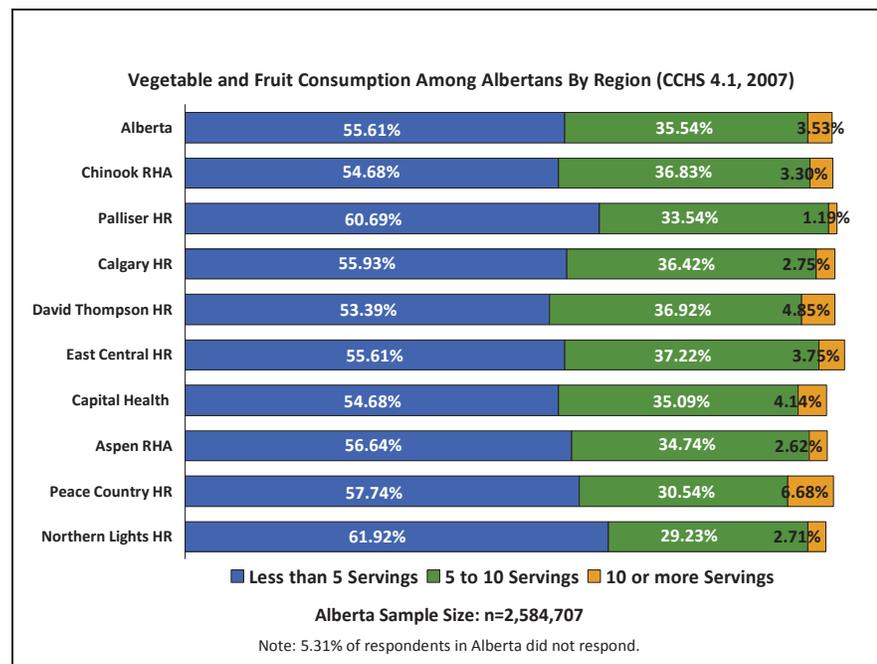
CCHS - Vegetable and Fruit Consumption

Data from the Canadian Community Health Survey (4.1, 2007) on vegetable and fruit consumption were aggregated from a series of 6 questions that asked participants about their frequency of consumption of fruit juices, whole fruits, green salads, carrots, potatoes (excluding French fries, potato chips and fried potatoes), and other vegetables, both in and outside of their homes(Statistics Canada, 2008a). Results from the aggregated series are reported as “times per

day within a 24-hour period. Inadequate vegetable and fruit consumption is defined as ‘less than 5 times per day’ (Statistics Canada, 2008a).

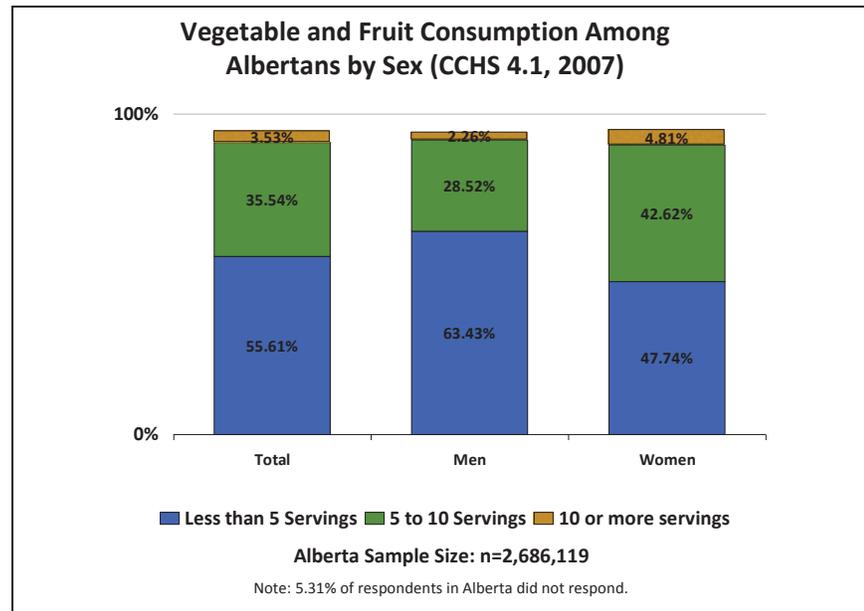
In 2007, the majority of Albertans (55.61%) reported eating vegetables and fruit less than 5 times per day (Figure 4.7). When compared by region, the former Northern Lights Health Region (61.92%) and Palliser Health Region (60.69%) had the most respondents to consume an inadequate daily amount of vegetables and fruit. Residents of the former David Thompson Health Region were most likely to consume more than 5 servings of vegetables and fruit per day (42.07% - 37.22% consumed 5 to 10 servings, while 4.85% consumed 10 or more). Regional differences such as these raise important issues around accessibility and affordability of vegetables and fruit, as well as other healthy food sources.

Figure 4.7 – Vegetable and Fruit Consumption among Albertans and residents of its Nine Former Regional Health Authorities (CCHS 4.1, 2007)



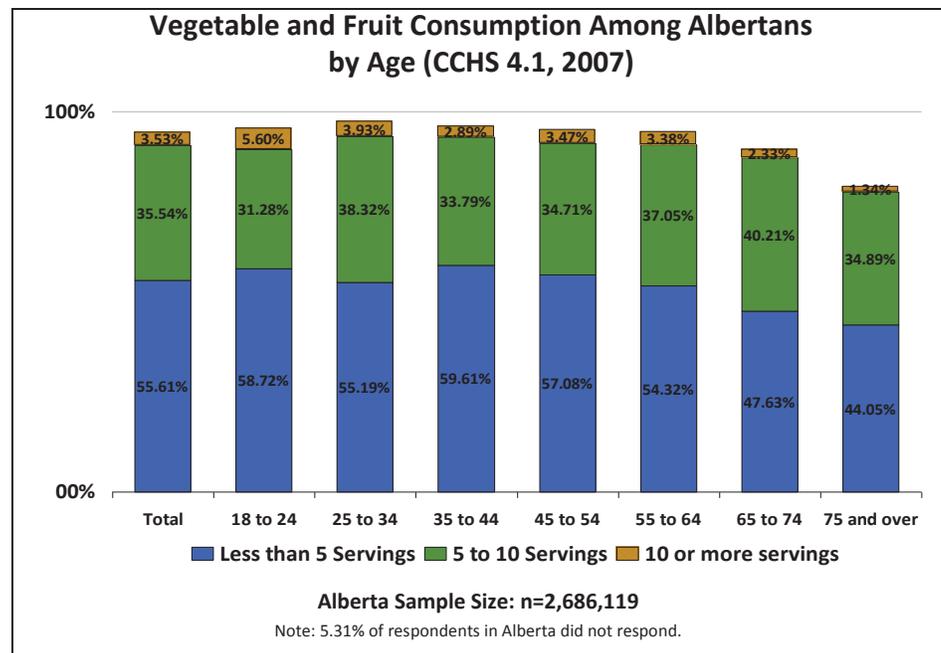
Measured by sex, Albertan men were significantly more likely than women to consume an inadequate daily amount of vegetables and fruit (64.4% of men compared to 47.7% of women), while women were significantly more likely to consume 5 to 10 servings on a daily basis (42.6% of women compared to 28.5% of men) (Figure 4.8).

Figure 4.8 – Vegetable and Fruit Consumption among Albertans measured by Sex (CCHS 4.1, 2007)



Inadequate vegetable and fruit consumption peaked between the ages of 35 and 44 years (59.61%). When examined in the different age brackets, the proportion of Albertans who consumed 5-10 servings gradually increased with age starting from the 35 to 44 year old age group (33.79%) and ending with 65 to 74 year old age group (40.21%) (Figure 4.9).

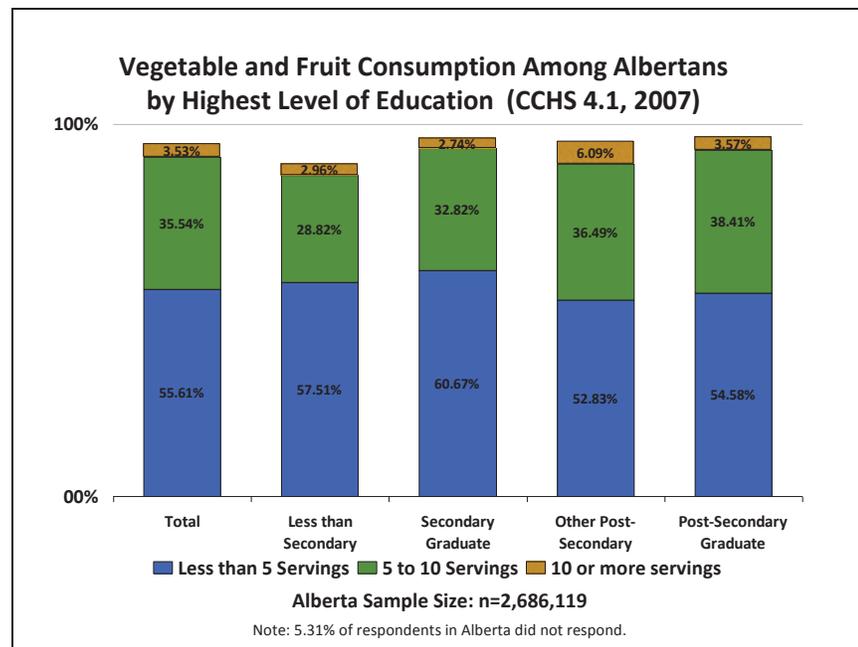
Figure 4.9 – Vegetable and Fruit Consumption among Albertans measured by Age (CCHS 4.1, 2007)



An analysis of inadequate vegetable and fruit consumption (less than 5 servings) by the highest level of education achieved and total household income did not identify any patterns or trends. Those most likely to consume inadequate daily amounts of vegetables and fruit were high school graduates (60.67%) and individuals who have a household income between \$15,000 and \$29,999 per year (61.1%), respectively (Figure 4.10).

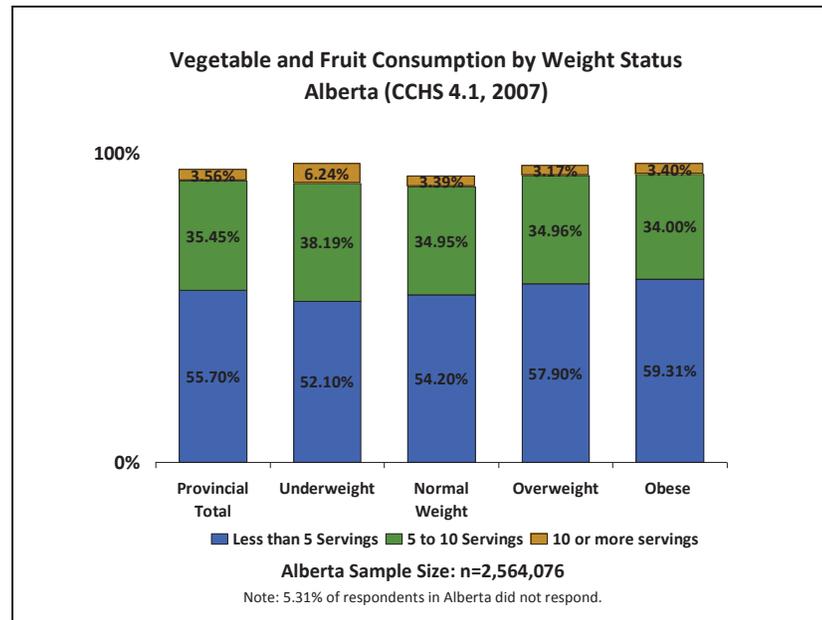
However, it was observed that as education increased the prevalence of consuming 5 to 10 servings as a recommended daily amount of vegetables and fruit also increased to a maximum prevalence rate of 38.41% among post-secondary graduates.

Figure 4.10 – Vegetable and Fruit Consumption among Albertans measured by Highest Level of Education (CCHS 4.1, 2007)



The prevalence of inadequate vegetable and fruit consumption (less than 5 servings per day) demonstrated a slight upward trend with weight status, increasing from underweight to obese (Figure 4.11). Nearly six-in-ten Albertans, classified as obese, do not consume an adequate amount of vegetables and fruit (59.3%).

Figure 4.11 – Vegetable and Fruit Consumption among Albertans measured by Weight Status (BMI) (CCHS 4.1, 2007)



Dietary Intake of Fibre, Sodium, and Fat

As demonstrated in Chapter 3, there are specific dietary factors, in addition to vegetable and fruit consumption that may decrease or increase the risk of specific diseases. An example of a nutrient that likely decreases the risks of developing colorectal cancer, type 2 diabetes, and cardiovascular diseases is dietary fibre (World Cancer Research Fund & American Institute for Cancer Research, 2007). A reduced risk of these chronic diseases can be achieved by consuming at least 25 grams of dietary fibre per day (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). However, nutrient intake data from 2004 suggests that Albertans do not meet this level of consumption and, on average, Albertan men only consume 19.2 grams, while women consume 13.9 grams of fibre per day¹⁵.

In contrast, probable evidence also suggests that sodium intake is linked to an increased risk of stomach cancer (Statistics Canada, 2004a). A high sodium intake is also associated with the development and worsening of hypertension, a strong risk factor for cardiovascular and cerebrovascular disease (He & MacGregor, 2004; Srinath Reddy & Katan, 2004; World Cancer Research Fund & American Institute for Cancer Research, 2007). The Global Report recommends

¹⁵ Data on fibre intake was taken from the second cycle of the 2004 Canadian Community Health Survey (CCHS 2.2), which was focused specifically on nutrition to provide more detailed information about nutrient intakes in Canada. Although men have higher absolute intakes of fibre, it must also be noted that fibre recommendations are higher for men than women. The Adequate Intake (AI) for fibre ranges from 30-38g/day for adult males and 21-25g/day for adult females. This CCHS dataset reveals that very few (less than 3%) of Albertan adults exceed the AI for their respective age and sex category.

that individuals should avoid salt-preserved foods, salted and salty foods, preserving foods with salt, as well as processed foods with high amounts of added salt (World Cancer Research Fund & American Institute for Cancer Research, 2007). The Report also recommends that an individual's average sodium intake should be below 2000 mg/day (World Cancer Research Fund & American Institute for Cancer Research, 2007). In 2004, nutrient intake data from the CCHS revealed that the average daily sodium intake among Albertan men was 3545 mg/day, compared to 2550 mg/day among women (World Cancer Research Fund & American Institute for Cancer Research, 2007). Furthermore, 96.6% of adult males and 65.9% of adult females had sodium intakes above the upper limit of 2300 mg/day, as defined by the Dietary Reference Intakes (DRI) (Institute of Medicine (U.S.). Panel on Dietary Reference Intakes for Electrolytes and Water, 2004). In both men and women, sodium intakes were also highest between the ages of 19-30, and tended to decrease with increasing age (Statistics Canada, 2004a).

Dietary fat also influences the risk of developing cardiovascular disease and type 2 diabetes. Specifically, a high intake of saturated fat accompanied with a low intake of polyunsaturated fat probably increases the risk of type 2 diabetes, while a high intake of saturated and trans fats is associated with increased risk of cardiovascular and cerebrovascular disease. To minimize these risks, it is generally recommended that saturated fat should contribute no more than 10% of total daily energy intake in the general population and no more than 7% in high risk populations, while trans fat intake should be minimized. In 2004, 25.1%¹⁶ of Albertan males and 29.5%¹⁷ of Albertan females, aged 19 years and older, had fat intakes exceeding the Acceptable Macronutrient Distribution Range (AMDR) for total fat (20-35% of total energy), as defined within the Dietary Reference Intakes (Institute of Medicine . Panel on Macronutrients & Institute of Medicine . Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, 2005; Statistics Canada, 2004a). Saturated fat, in particular, contributed 9.8% and 10.7% of total energy among Albertan men and women respectively (Statistics Canada, 2004a). Over 25% of Albertan males and females, over the age of 19 years, obtained more than 10% of their daily calories from saturated fat (Statistics Canada, 2004a), which may have contribute to an increased risk of type 2 diabetes and cardiovascular diseases.

¹⁶ The coefficient of variation for this estimate was between 16.6% to 33.3%, and according to Statistics Canada should be interpreted with caution

¹⁷ The coefficient of variation for this estimate was between 16.6% to 33.3%, and according to Statistics Canada should be interpreted with caution

Food Choices

The majority of Albertans reported that they either choose or avoid specific foods because of concerns related to their general health (61.5%) and body weight (50.8%). Fewer choose or avoid foods because they are concerned about heart disease (39.77%), while only 28% of Albertans based their food choices because they are concerned about cancer (Figure 4.12). In terms of food content, most Albertans are likely to choose or avoid specific foods because of their fat content (66.5%), fibre content (58.07%) or caloric content (51.43%) (Figure 4.13).

Figure 4.12 – Food Choices among Albertans – Choose or Avoid Foods for Reasons Related to Health or Illness

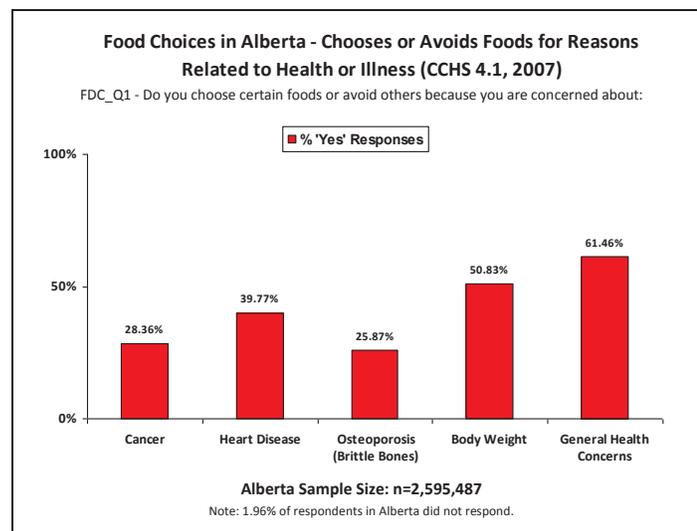
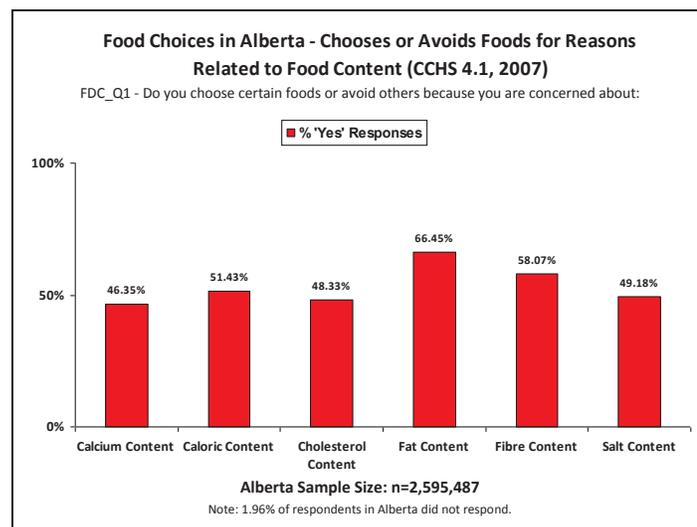


Figure 4.13– Food Choices among Albertans – Choose or Avoid Foods for Reasons Related to Food Content



Nutrition Summary

Results from the CCHS (4.1, 2007) indicated that inadequate vegetable and fruit consumption (less than five servings per day) was highest among individuals who were aged 35 to 44 years old, of lower education and income status, overweight or obese, and Albertan men. Residents of the Northern Lights and Palliser health regions, respectively, were the most likely of the nine former regional health authorities to consume an inadequate daily amount of vegetables and fruit.

In order to reduce the risk of nutrition and diet-related diseases, programs and strategies should be focused on the identified population groups with the lowest levels of vegetable and fruit consumption and target men, individuals of lower educational and income status, and Albertans who are overweight or obese to improve their nutritional intake. A recommended component of any vegetable and fruit strategy should also consider what health-related and content factors have the greatest influence and impact on the food choices of Albertans.

Alcohol Consumption

The extent to which alcoholic drinks increase the risk of chronic disease depends on the amount of alcohol a person drinks over their lifetime and the frequency of consumption. Alcohol consumption also has a well-established, synergistic association with tobacco use, where the combined level of risk for heart disease, stroke and various oral cancers (e.g., pharynx cancer and esophagus cancer) is even greater than the risk associated with each as independent risk factors (Watson, 1992). Independently, high alcohol intake is associated with an increased risk of stroke and cancers of the mouth, pharynx, larynx and esophagus (World Cancer Research Fund & American Institute for Cancer Research, 2007). While these cancers are not the most prevalent in Alberta, convincing evidence also exists that alcoholic drinks are associated with colorectal cancer in men and breast cancer in women, which are two of the most common cancers in the province.

CCHS (4.1, StatCan 2007) data on alcohol consumption was divided into 4 categories (Statistics Canada, 2008a):

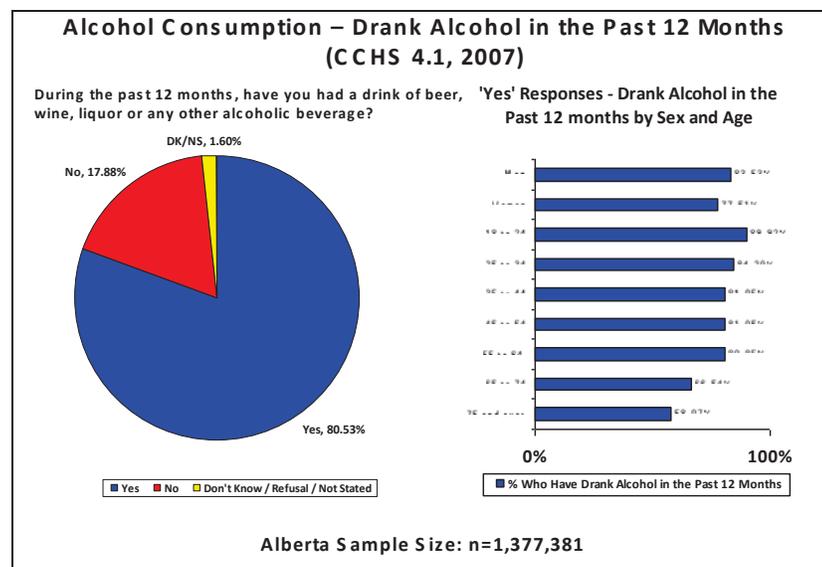
- *Regular drinkers* – participants who reported to having consumed an alcoholic beverage at least once per month;
- *Occasional drinkers* – participants who reported to having consumed an alcoholic beverage less than once per month;
- *Former drinkers* – participants who reported ‘yes’ to having consumed an alcoholic beverage but who no longer drink; and,

- *Never drinkers* – participants who reported ‘no’ to having ever consumed an alcoholic beverage.

Data specific to alcohol consumption in terms of the volume consumed on a daily, monthly or yearly basis was not available.

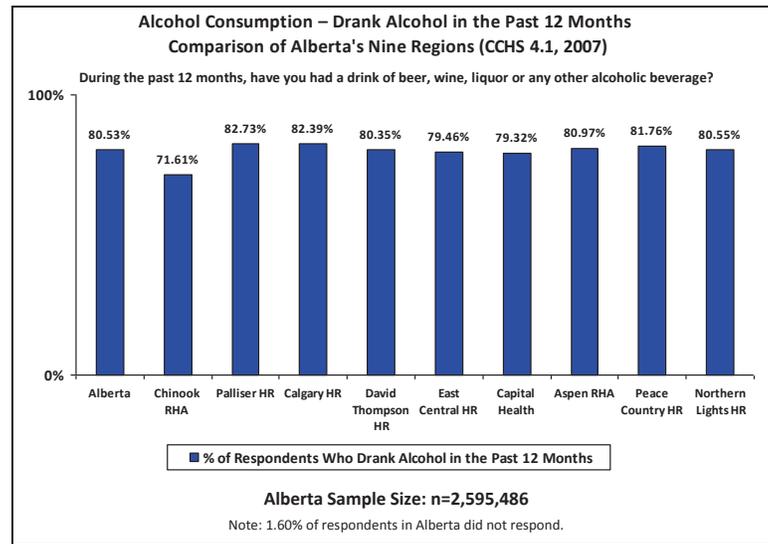
In 2007, eight-in-ten Albertans reported having an alcoholic drink sometime in the past 12 months (80.5%) The percentage of individuals who drank decreased with increases in age from 89.9% of those aged 18 to 24 to 58.1% of those aged over 75 years. Men were marginally more likely to drink than women (83.5% compared to 77.5%) (Figure 4.14).

Figure 4.14 - Alcohol Consumption among Albertans – Drank Alcohol in the Past 12 months – measured by Sex and Age (CCHS 4.1, 2007)



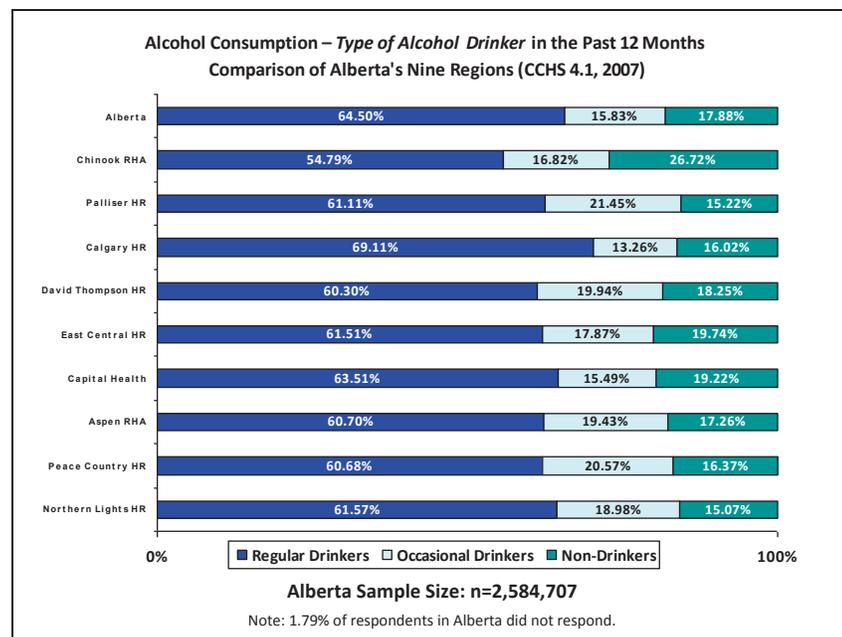
Most health regions had similar proportions of respondents who had had a drink of alcohol in the past year at the time of the survey (around 80%), with the only significant difference being a much lower prevalence rate among residents of the former Chinook Regional Health Authority (71.6%) (Figure 4.15).

Figure 4.15 - Alcohol Consumption – Drank Alcohol in the Past 12 months – among Albertans and residents of its Nine Former Regional Health Authorities (CCHS 4.1, 2007)



Comparing the former regional health authorities, there were noticeable differences in the types of alcohol drinkers. Calgary Health Region (69.1%) had a significantly high percentage of regular drinkers than other regional health authorities and Alberta as a whole (64.5%) The other urban-based region, Capital Health, had the second most residents who were ‘regular drinkers’ (63.5%). Once again, the former Chinook RHA had the lowest proportion of residents who were ‘regular drinkers’ (Figure 4.16).

Figure 4.16 - Alcohol Consumption – Type of Alcohol Drinker in the Past 12 months – among Albertans and residents of its Nine Former Regional Health Authorities (CCHS 4.1, 2007)



Overall, the trends for alcohol consumption highlighted that (Statistics Canada, 2008a):

- Albertan men were significantly more likely than women to be ‘regular drinkers’ (72.9% compared to 56.1%) (Figure 4.17).
- The proportion of ‘regular drinkers’ decreased as respondents became older – the highest proportion was among Albertans 18 to 24 years of age (75.5%), while the lowest proportion was among those who are 75 years or older (41.9%) (Figure 4.18).
- Respondents who pursued a post-secondary education were the most likely to be ‘regular drinkers’ (70.42%, other post-secondary attendees; 67.81% post-secondary graduates) (Figure 4.19).
- The prevalence of ‘regular drinkers’ was highest among respondents in the highest income bracket, \$80,000 or more (75.56%), which was significantly higher than the rest of Alberta, overall and in all other income brackets (Figure 4.20).

Figure 4.17 - Alcohol Consumption – Type of Alcohol Drinker in the Past 12 months – among Albertans measured by Sex (CCHS 4.1, 2007)

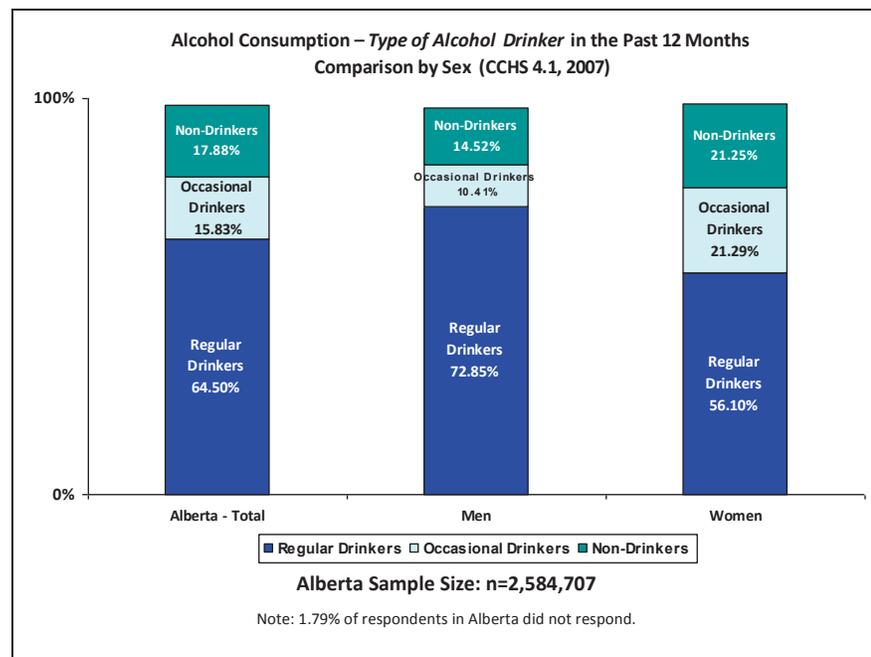


Figure 4.18 - Alcohol Consumption – Type of Alcohol Drinker in the Past 12 Months – among Albertans measured by Age (CCHS 4.1, 2007)

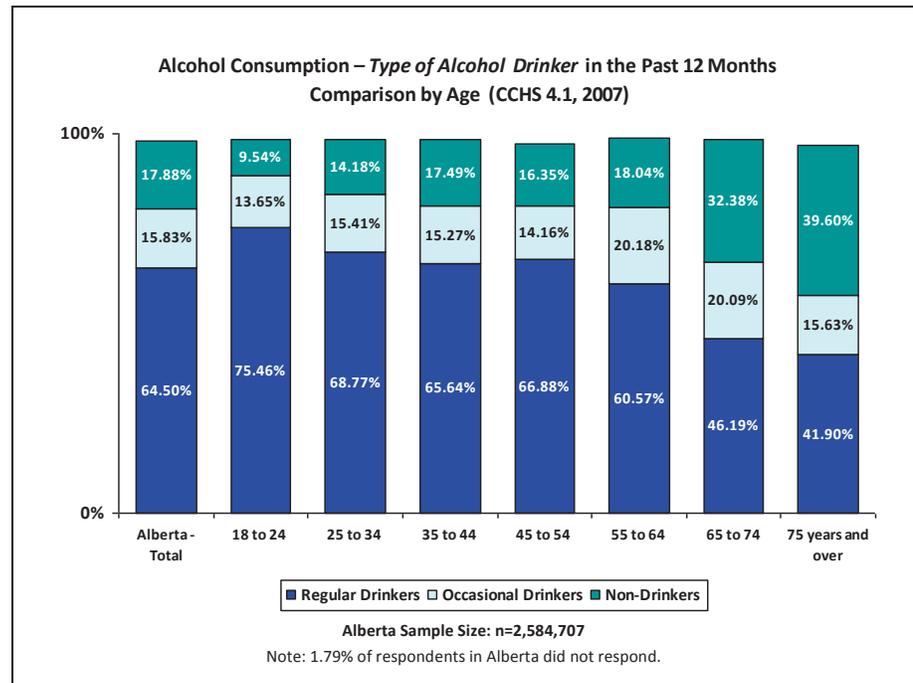


Figure 4.19 - Alcohol Consumption – Type of Alcohol Drinker in the Past 12 Months – among Albertans measured by Highest Level of Education (CCHS 4.1, 2007)

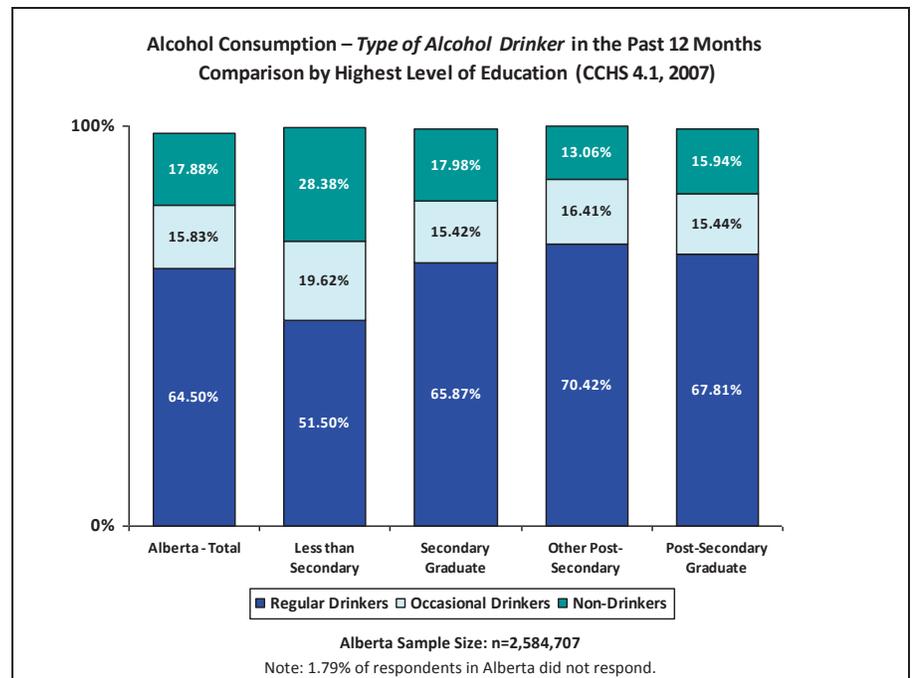
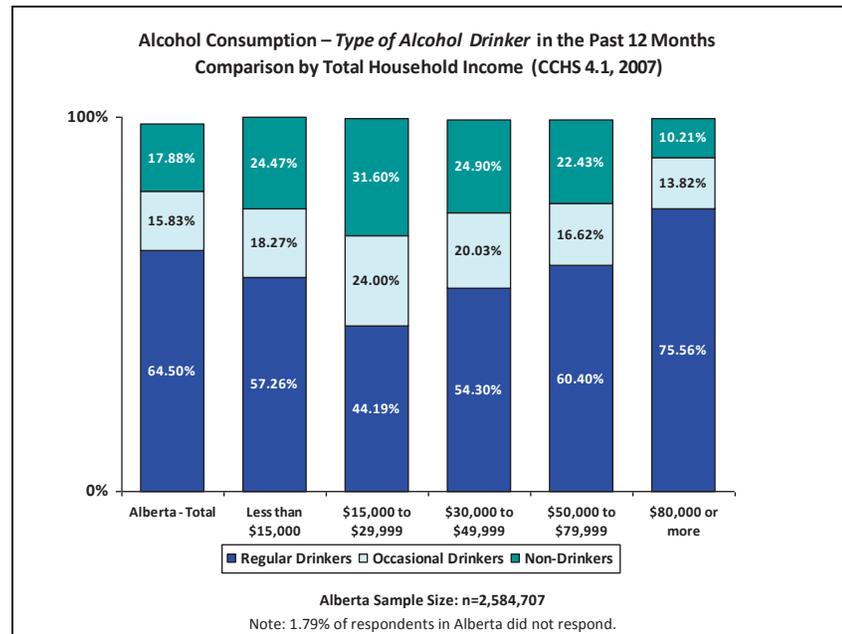


Figure 4.20 - Alcohol Consumption – Type of Alcohol Drinker in the Past 12 Months – among Albertans measured by Total Household Income (CCHS 4.1, 2007)



Alcohol Consumption Summary

It has been convincingly demonstrated that excessive consumption of alcohol, where 15 to 20 per cent or more of one’s dietary intake is alcohol, can increase the risk of stroke and oesophagus, mouth, larynx, colorectal and breast cancer (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Based on alcohol consumption-specific data from the CCHS (4.1, 2007), Albertan men (72.85%), 18 to 24 years old (75.46%), and household earners of \$80,000 or more (75.56%) are most likely to be regular drinkers who consume alcohol at least once per month. However, it is difficult to determine the proportion of regular and occasional drinkers who have excessive levels of consumption. More data is needed to examine the regularity of drinking, the linkages between consumption and other risk factors such as tobacco use, and the amounts of alcohol consumed by Albertans.

Physical Activity

Regular, moderate to vigorous physical activity has a convincing association with a reduced risk of type 2 diabetes, cardiovascular and cerebrovascular disease, and colon and breast cancer (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Physical activity also protects against many of the biological mechanisms that are associated with maintaining a healthy body weight and preventing obesity, including body fatness, controlling metabolism and insulin resistance (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Other general health benefits of physical activity also can include improved mental health, reduced stress, and stronger muscles, amongst others (Public Health Agency of Canada (PHAC) & Canadian Society for Exercise Physiology (CSEP), 2006).

The Alberta Centre for Active Living's 2009 Alberta Survey on Physical Activity

In 2008, the Alberta Centre for Active Living (ACAL), in collaboration with the Population Research Laboratory at the University of Alberta, conducted the Alberta Survey on Physical Activity. The biennial survey is intended to monitor the physical activity status of Albertans throughout the province (Loitz, Berry, & Spence, 2009.). A sample of 1,211 respondents aged 18 years and over was surveyed within three targeted subsamples (Edmonton, Calgary and the rest of the province). These subsamples were selected because they represent near equal thirds of the Alberta population (Statistics Canada, 2006)¹⁸. The data for these subsamples were also weighted to be proportional to the actual populations they represented.

Topic-specific data were collected on leisure-time physical activity beliefs, attitudes and behaviours, among other key topics. To estimate the leisure-time physical activity levels, a measure was used to consider how much strenuous, moderate and mild physical activity was performed per week for more than 15 minutes per time during an average week. According to the ACAL (Loitz et al., 2009):

- Strenuous activities include running, hockey, vigorous swimming, aerobics and other activities that will cause sweating and a faster heart beat.
- Moderate activities include fast walking, easy swimming and dancing.
- Mild activities include yoga and easy walking.

¹⁸ According to the 2006 Census (StatCan 2006), Calgary (32.80%), Edmonton (31.45%) and the rest of Alberta (35.74%) each account for close to one-third of the total provincial population.

The results of the survey indicate that 58.5% of Albertans are sufficiently active, through specific amounts of moderate or strenuous activity per week, to experience health benefits (59.4% of women and 57.7% of men), which is a slight decrease from 62.4% in 2007(Loitz et al., 2009.). Physical activity levels vary across the province among residents of Calgary (64.0%), Edmonton (55.4%), and the rest of Alberta (56.1%) (Statistics Canada, 2008a)¹⁹. These regional variations may be influenced by the types of physical activity residents in the respective regions are most likely to do, as well as the amount of time they have to do them.

The ACAL survey also demonstrates how physical activity rates in Alberta decrease with age, as 81.2% between the ages of 18 and 24 are sufficiently active to experience health benefits compared to 36.9% who are 65 years or older (Loitz et al., 2009.).

With respect to education level and annual household income, there appears to be a threshold effect by which rates of physical activity become significantly higher. The existence of this threshold is supported by the following observations (Loitz et al., 2009.):

- 57.0% of Albertans who completed high school and 59.9% of Albertans who pursued a post-secondary education are sufficiently active, compared to 47.8% who did not complete high school; and,
- A majority of those with an annual household income between \$40,000 and \$59,999 are sufficiently active (57.5%, which is a proportion that improves as income increases), compared to slightly over two-thirds of Albertans with an income of \$39,999 or less (36.7%).

Accessibility and Awareness Factors that Influence Physical Activity

Accessibility and awareness factors were found to influence the proportion of Albertans who were sufficiently physically active. These factors included (Loitz et al., 2009.):

- Access to physical activity facilities; the findings demonstrate that with greater perceived access to physical activity facilities, the proportion of sufficiently active Albertans is likely to increase.
- The pursuit of information on physical activity; 59% of those found to be sufficiently active had previously sought out information about physical activity.

¹⁹ As will be demonstrated in an analysis of data from the Canadian Community Health Survey (4.1, StatCan), the physical activity levels of residents of the Calgary Health Region are significantly higher than most other regional health authorities in the province of Alberta.

- The awareness of health campaigns and resources; the majority of sufficiently active Albertans reported being aware of Canada's Food Guide (85.0% compared to 80.3% of those inactive), ParticipACTION (79.4% compared to 74.4% of those inactive) and Canada's Physical Activity Guide (53.5% compared to 46.2% of those inactive)

Psychological Factors that Influence Physical Activity

The concept of self-efficacy was demonstrated by the Alberta Survey on Physical Activity to significantly increase the proportions of physically active Albertans. In most cases, having the confidence to participate in regular physical activity, overcome potential barriers such as time constraints, bad weather or feeling tired, and to make schedule arrangements to accommodate an active lifestyle led more Albertans to be sufficiently physically active. Other psychological factors that were shown to increase the likelihood of being physically active included: the belief in the health benefits of physical activity (also known as outcome expectancy); the intention to participate in physical activity in the near future; and the perceived opportunities to participate in regular physical activity.

Canadian Community Health Survey (CCHS)

Leisure-Time Physical Activity

The CCHS (4.1, 2007) data on physical activity were aggregated from a series of questions that examined the leisure-time physical activity characteristics, including the type (what activities respondents performed), frequency (how often they performed the activities), and duration (how long did each activity last per time) of the activities performed by Canadians during their recreation time.

This measure of physical activity is not the same as the measure used by the Alberta Active Living Survey and also does not encompass the activity performed at the workplace, household or via transportation. This latter point is a limitation of many physical activity questionnaires because respondents, most often, do not account for their everyday activities, such as walking around their home or office, when reporting how much they are physically active.

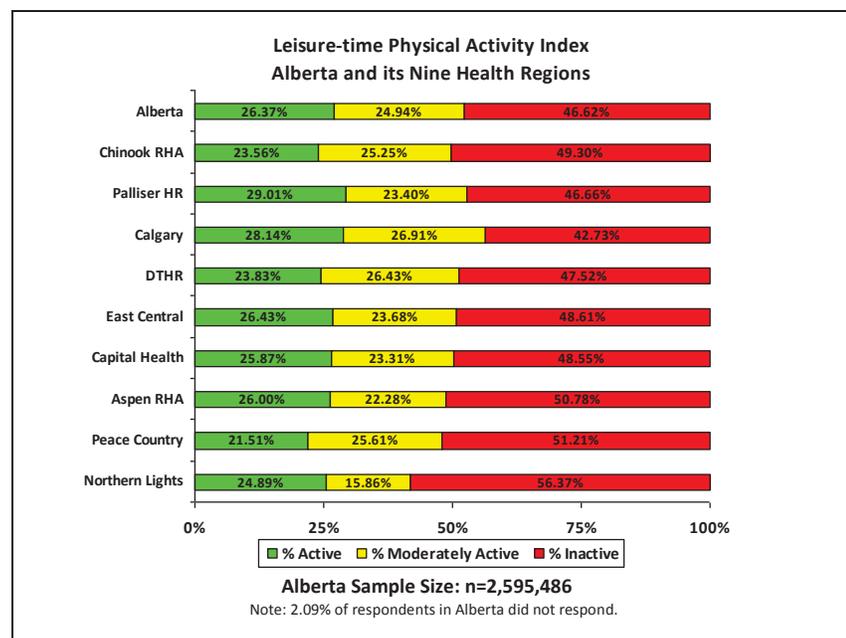
For the analysis of the leisure-time physical activities of Albertans, participants were classified as (Statistics Canada, 2008a):

- *Active* – leisure-time energy expenditure of more than 3 kilocalories per kilogram of body weight per day;
- *Moderately Active* – leisure-time energy expenditure of 1.5 to less than 3 kilocalories per kilogram of body weight per day;

It is encouraging to note that one-half (51.3%) of Albertan adults were either active (26.4%) or moderately active (24.9%), respectively, during their leisure time in 2007. However, slightly less than one-half were also physically inactive during their leisure time (46.6%) (Figure 4.21).

The former regional health authority with the largest proportion of physically active residents was the Palliser Health Region (29.0%), which was followed closely by the Calgary Health Region (28.1%). In contrast, the most inactive regions were the Northern Lights Health Region (56.4%), the Peace Country Health Region (51.2%), and Aspen Regional Health Authority (50.8%).

Figure 4.21 - Leisure-time Physical Activity among Albertans and residents of its Nine Former Regional Health Authorities (CCHS 4.1, 2007)



In Alberta in 2007 it was observed that (Statistics Canada, 2008a):

- Near equal proportions of men and women were physically inactive during their leisure-time (46.7%) (Figure 4.22).
- The prevalence of physical inactivity increased with age; the lowest prevalence was among the 18 to 24 year old age group (40.08%), while the highest was among the 75 year and older bracket (57.59%) (Figure 4.23).
- By education, physical inactivity was highest among Albertans with the least amount of education – less than high school (secondary education) (58.41%). The most active respondents were post-secondary graduates (29.51% were active) (Figure 4.24).
- By total household income, more than one-half of Albertans who earned less than \$49,999 per year (within different income brackets)

were physically inactive during their leisure time. As expected, earners of \$80,000 or more were the most active (31.36%) and moderately active (26.39%), as well as the least inactive (41.45%) during their leisure-time (Figure 4.25).

Figure 4.22 - Leisure-time Physical Activity among Albertans measured by Sex (CCHS 4.1, 2007)

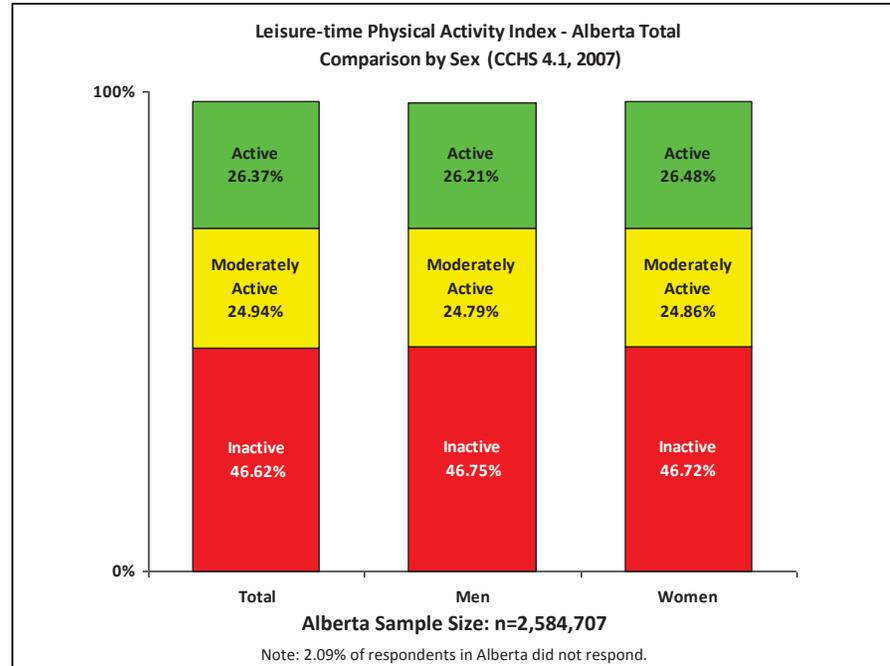


Figure 4.23 - Leisure-time Physical Activity among Albertans measured by Age (CCHS 4.1, 2007)

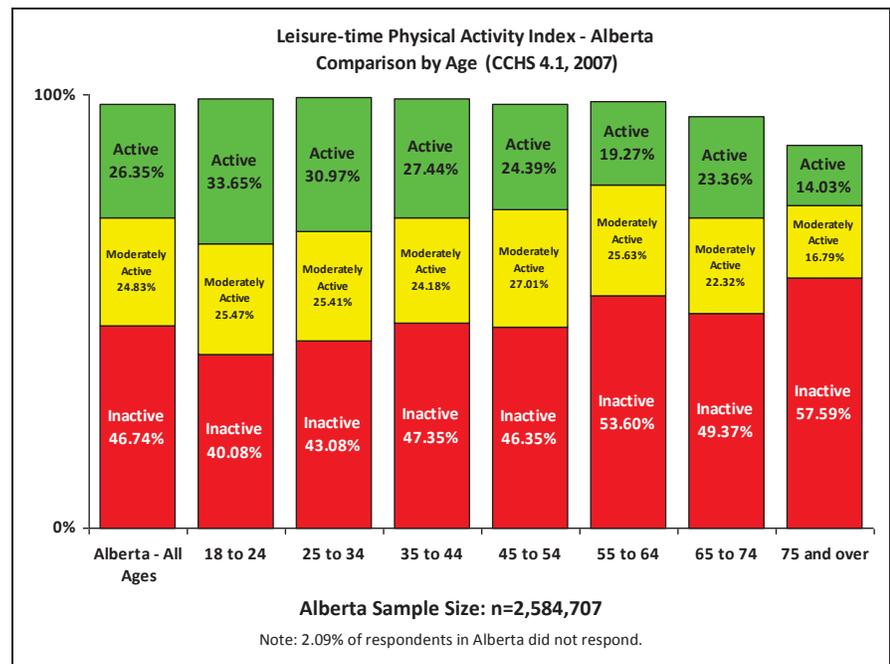


Figure 4.24 - Leisure-time Physical Activity among Albertans measured by Highest Level of Education (CCHS 4.1, 2007)

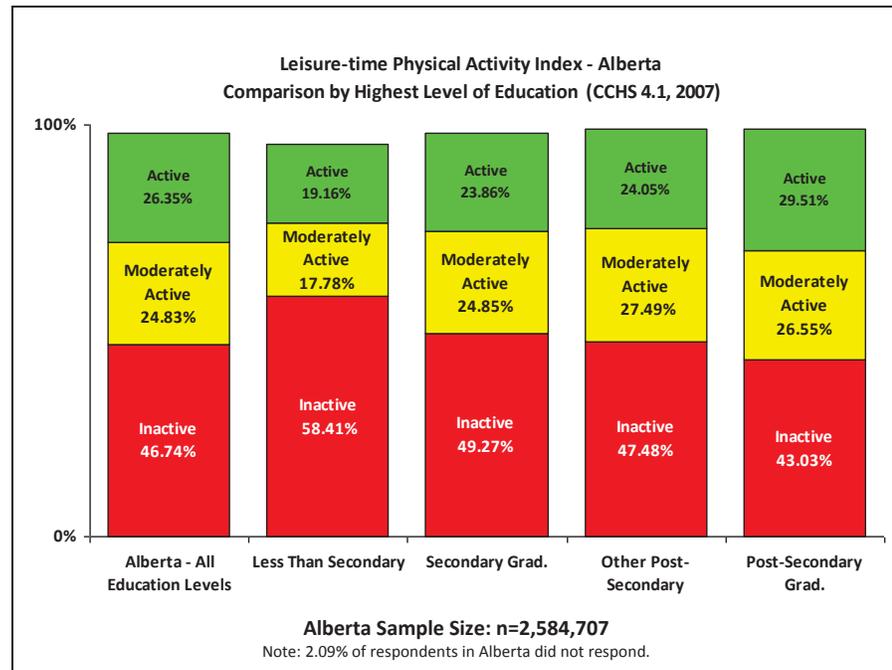
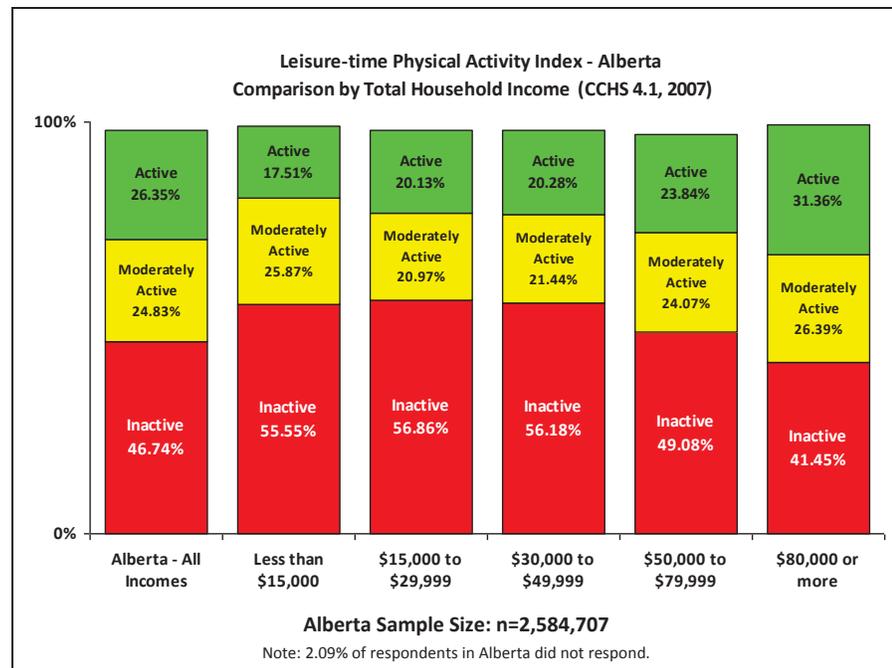
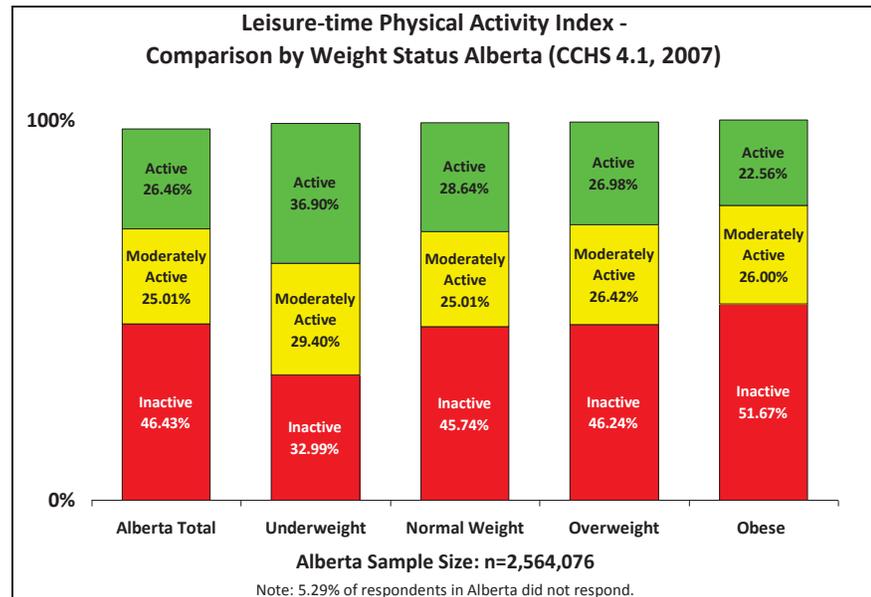


Figure 4.25 - Leisure-time Physical Activity among Albertans measured by Total Household Income (CCHS 4.1, 2007)



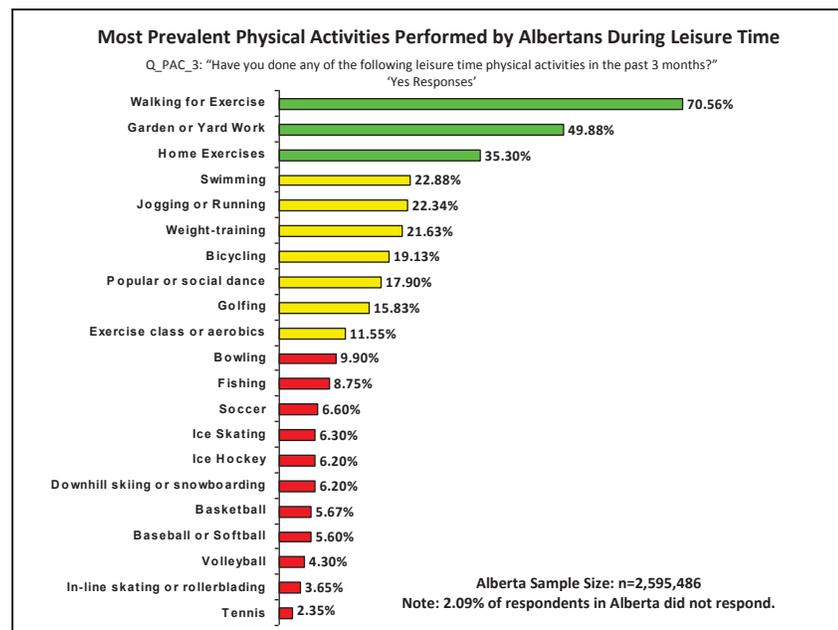
When measured by weight status, as determined by Body Mass Index (BMI), the prevalence of physical inactivity increased; the most inactive were respondents with an obese weight status (51.67%) while the least inactive were those respondents who were underweight (32.99%) (Figure 4.26).

Figure 4.26 - Leisure-time Physical Activity among Albertans measured by Weight Status (BMI)
(CCHS 4.1, 2007)



According to the CCHS (2007), walking was the most popular leisure-time physical activity among Albertans in 2007 (70.56%), and its popularity has also increased slightly since 2005 (68.7%). Other popular activities included gardening / yard work (49.88%), home exercises (35.30%), swimming (22.88%), jogging or running (22.34%), and weight-training (21.63%), respectively. Measured by sex, a significantly larger proportion of women reported to ‘walking for exercise’ during their leisure time (76.48% compared to 64.70% of men) (Figure 4.27).

Figure 4.27 - Most Frequently Reported Physical Activities Performed by Albertans during Leisure-Time (CCHS 4.1, 2007)



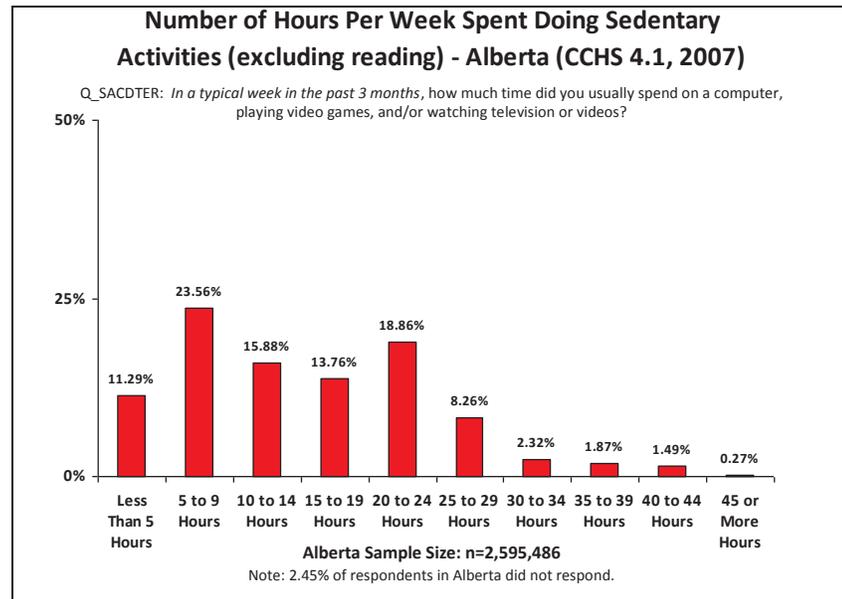
Sedentary Activity

A sedentary lifestyle is characterized by a lack of physical activity and is likely to involve sitting, watching television and computer use for long periods of time on a daily basis. How sedentary or inactive an individual must be in a given timeframe to have a high risk for chronic disease is still unknown, but it has been established that a lack of physical activity is a leading cause of preventable death worldwide (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006). Research has also indicated that a lifestyle high in sedentary behaviour and physical inactivity can trigger specific biological processes that lead to specific diseases (World Cancer Research Fund & American Institute for Cancer Research, 2007).

The 2007 CCHS asked Canadian adults about the amount of time they spent engaging in three sedentary behaviours: watching television (including videos), using a computer (including the Internet and computer games) and reading. Respondents were instructed to report their leisure-time hours only and to exclude time spent doing these activities at work and/or school (Shields & Tremblay, 2008b). The CCHS survey is also administered throughout the year, which for measuring sedentary activity eliminates the effect of seasonality and the hypothesis that people are more sedentary during specific times of year (e.g., winter) (Gordon-Larsen, Nelson, & Popkin, 2004; Statistics Canada, 2008a). CCHS estimates for sedentary activity should also be interpreted with caution, as they are subject to: (i) social desirability bias, where respondents respond in a manner that will be viewed favourably by others which can lead to an over-reporting of “good” behaviour and an under-reporting of “bad” behaviour; and (ii) recall error, where a respondent is unable to accurately recall or remember actual behaviour or events (Shields & Tremblay, 2008a; Statistics Canada, 2008a).

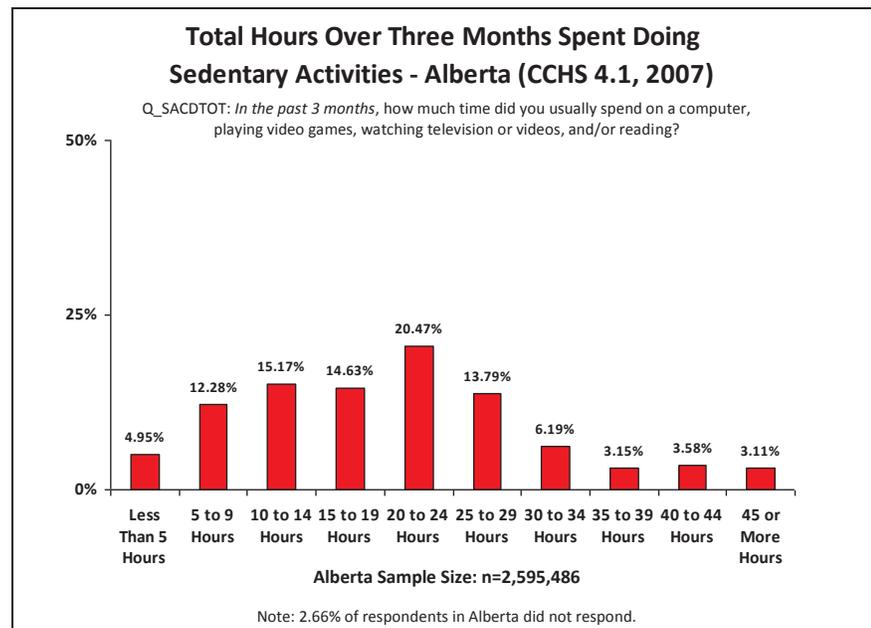
At the time of the survey, nearly one-quarter of Albertans reported spending 5 to 9 hours either on a computer, playing video games and/or watching television or videos during a typical week (23.56%). An additional 18.86% reported spending between 20 and 24 hours per week doing these activities (Figure 4.28).

Figure 4.28 - Sedentary Activity – Number of Hours Spent by Albertans Per Week Doing Sedentary Activities (excluding reading) (CCHS 4.1, 2007)



When examined over the total course of three months, the largest proportion of Albertans spent 20 to 24 hours being sedentary, which included the activity of reading (20.47%). Moreover, when the proportions were combined, the data indicated that approximately one-half (47.03%) spent 19 hours or less being sedentary over three months (29.82%) (Figure 4.29).

Figure 4.29 - Sedentary Activity – Total Number of Hours Spent by Albertans Over Three Months Doing Sedentary Activities (including reading) (CCHS 4.1, 2007)



Physical Activity & Sedentary Activity Summary

Physical activity can exert a “disease-preventive effect”, especially when combined with individual efforts to eat a nutritious diet and maintain a healthy body weight. Individuals who are physically active put themselves at a lower risk for developing colon and breast cancer, and many other chronic diseases (World Cancer Research Fund & American Institute for Cancer Research, 2007). The prevalence of physical activity among Albertan adults needs to improve. Based on data from the CCHS (4.1, StatCan 2007), future programmatic efforts should address at least two key findings. Nearly one-half of Albertans reported being inactive during their leisure time (46.4%) or spending at least 15 hours per week being sedentary (46.8%) in 2007. Second, the prevalence of physical inactivity is similar for men and women but increases with weight status, and is intricately associated with the socioeconomic indicators of education and income. Accordingly, efforts should be targeted towards identifying and addressing specific barriers to physical activity among individuals of lower socioeconomic status.

Alberta Health Services’ Public Health Innovation and Decision Support also supports the design, delivery and evaluation of programs that seek to increase four types of physical activity: Occupational (at work); Household (in the home); Transport (such as traveling to and from work); and Recreational (during leisure time). Overall, efforts should be targeted to:

- Capitalize on those physical activities Albertans are most likely to take part in, such as walking for exercise, gardening or yard work and home exercise;
- Promote sufficient accessibility and awareness of physical activity facilities and other opportunities; and,
- Reduce sedentary activity and screen time (e.g., on a computer, playing video games and watching television or videos).

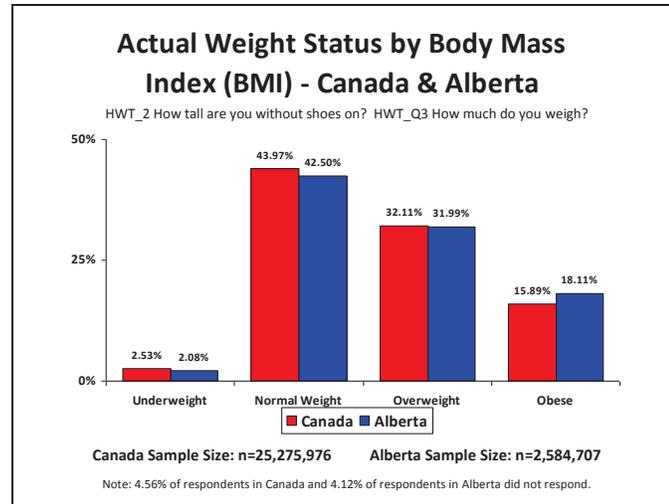
Weight Management

Maintaining an energy balance between caloric intake and caloric expenditure is one of the most important ways to protect against both obesity and chronic disease. Without a balance between energy intake and expenditure, an individual can put themselves at high risk for becoming overweight or obese which, as individual weight statuses, have convincing linkages to type 2 diabetes, heart disease and cancers of the pancreas, colon and breast, amongst others.

Data on body weight status were calculated from self-reported height and weights to derive a body mass index (BMI) score for each survey participant

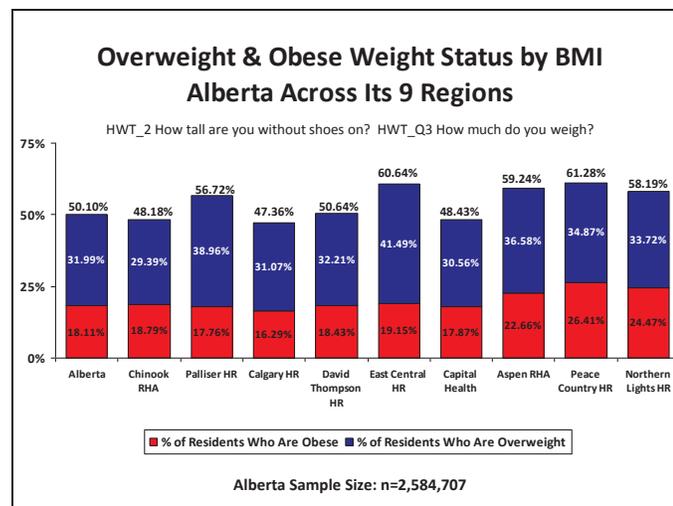
(Statistics Canada, 2008a). In Alberta, nearly one-third (31.99%) of individuals aged 18 years and older were classified as overweight (BMI of 25 to 29.99), with an additional 18.11% classified as obese (BMI of 30 or more). Combined this equates to 50.1% of the Alberta adult population, which is slightly higher than Canada’s combined prevalence rate for overweight and obesity (48%) (Figure 4.30).

Figure 4.30 - Weight Status as measured by Body Mass Index (BMI) among Albertans and Canadians (CCHS 4.1, 2007)



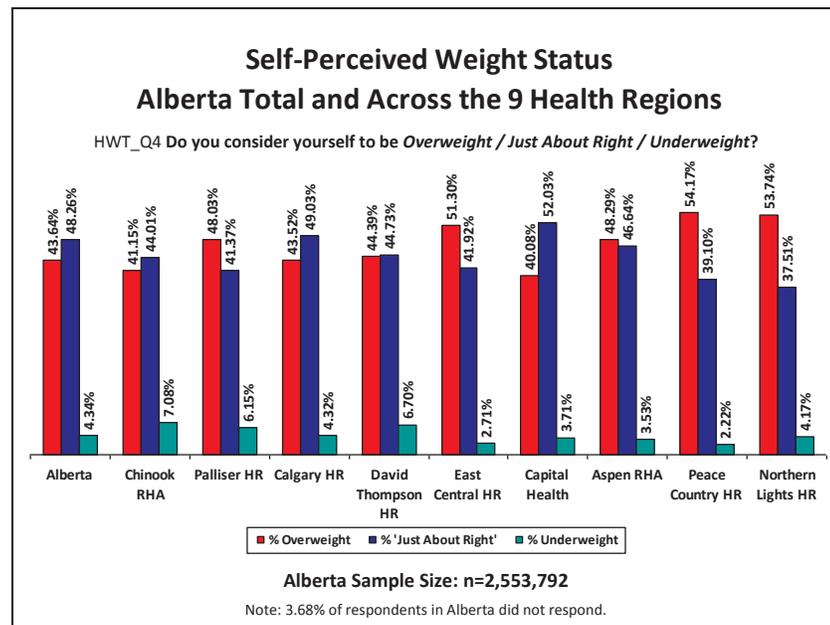
The prevalence of overweight and obesity was highest in the former Peace Country (61.28%) and East Central (60.64%) Health Regions. Aspen RHA (59.24%), Northern Lights HR (58.19%), and Palliser HR (56.72%) also had high levels of overweight and obesity. The urban health regions of Calgary (47.36%) and Capital Health (48.43%) had the lowest prevalence rates for the two combined weight statuses (Figure 4.31).

Figure 4.31 - Overweight and Obese Weight Status as measured by Body Mass Index (BMI) among Albertans and residents of the Nine Former Regional Health Authorities (CCHS 4.1, 2007)



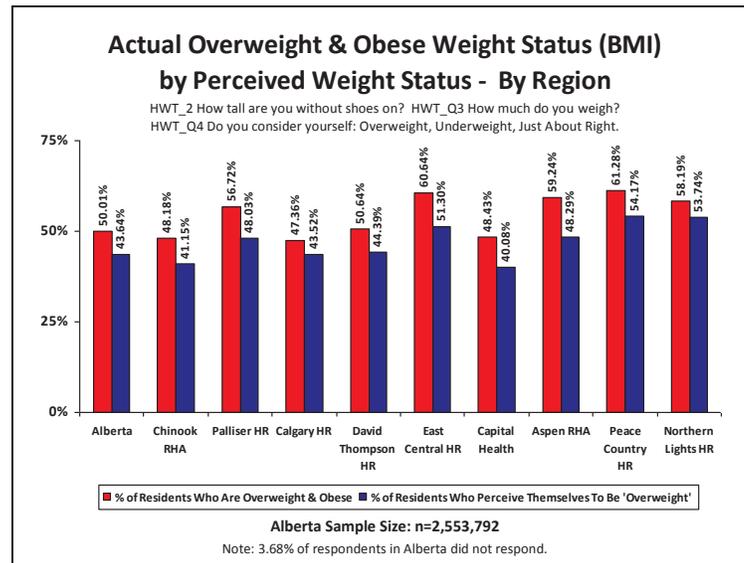
Provincially, slightly less than one-half of Albertans considered their weight to be ‘just about right’ (48.26%), with an additional 43.64% noting that they were ‘overweight’. Regionally, over one-half of residents in the former Peace Country (54.17%), Northern Lights (53.74%), and East Central (51.30%) Health Regions reported that they considered themselves to be ‘overweight’. Capital Health was the region with the fewest respondents to consider themselves to be overweight (40.08%) and the most respondents to consider their weight to be ‘just about right’ (52.03%). (Figure 4.32)

Figure 4.32 - Perceived Weight Status among Albertans and residents of the Nine Former Regional Health Authorities (CCHS 4.1, 2007)



There was a low observed concordance between those who perceived themselves to be overweight and those who actually were. None of the former nine regional health authorities demonstrates an equal proportion of residents who are actually overweight or obese and those who perceive themselves to be ‘overweight’. Calgary Health Region (a difference of 3.84%) and Northern Lights Health Region (a difference of 4.45%) have the most similar proportions. Aspen Regional Health Authority (a difference of 10.95%) and East Central Health Region (a difference of 9.34%) have the most dissimilar proportions. (Figure 4.33)

Figure 4.33 - Weight Status as measured by Body Mass Index Compared to Perceived Weight Status among Albertans and residents of the Nine Former Regional Health Authorities (CCHS 4.1, 2007)

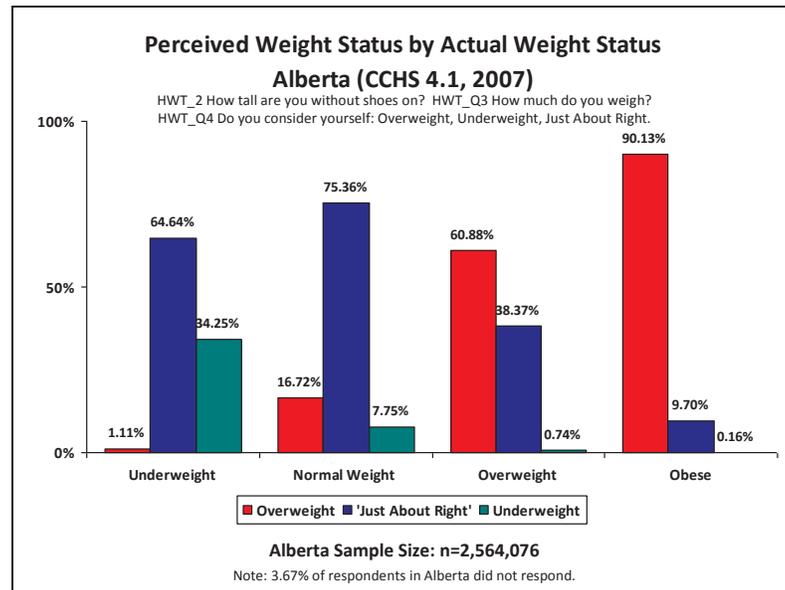


There is an intricate link between a person’s actual weight status (as measured by the BMI) and their perceived weight status²⁰. When a person has an accurate perception of their weight, it can give them a clearer indication of how it affects their overall or respective elements of their health. It can also give them, as well as others including health professionals, an indication of how willing and prepared they are to try to lose weight and keep it off (Prochaska & Velicer, 1997). Accordingly, a possible link may exist between an accurate self-perception of weight and the willingness to participate in programs directed at improved nutrition, physical activity and weight management.

60.9% of overweight Albertans considered themselves as such. By comparison, 90.1% of obese Albertans considered themselves to be ‘overweight’ (Figure 4.34).

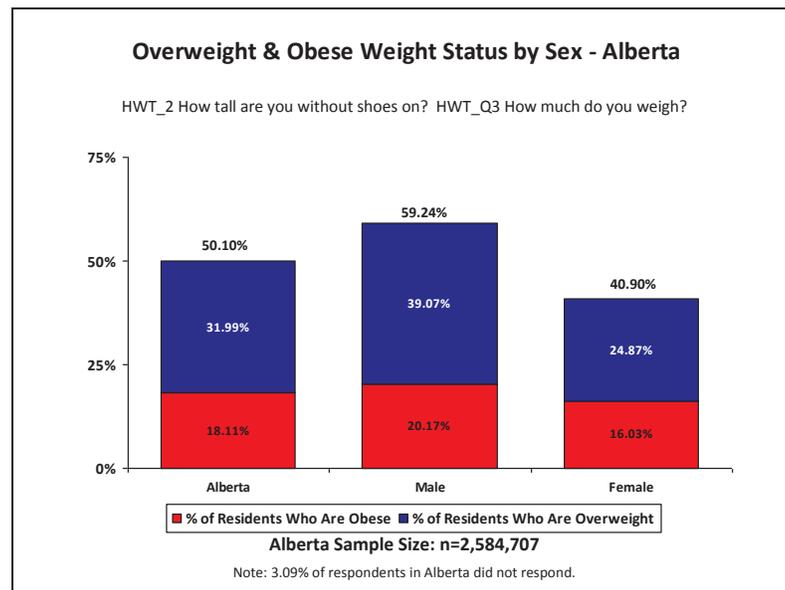
²⁰ Currently, in the CCHS’s assessment of Perceived Weight Status, the highest measured perceived weight status is ‘overweight’, not obese. Accordingly, there is no way to compare potential differences that may exist as result of whether respondents perceive themselves to be ‘overweight’ versus ‘obese’.

Figure 4.34 - Weight Status as measured by Body Mass Index Compared to Perceived Weight Status among Albertans (CCHS 4.1, 2007)



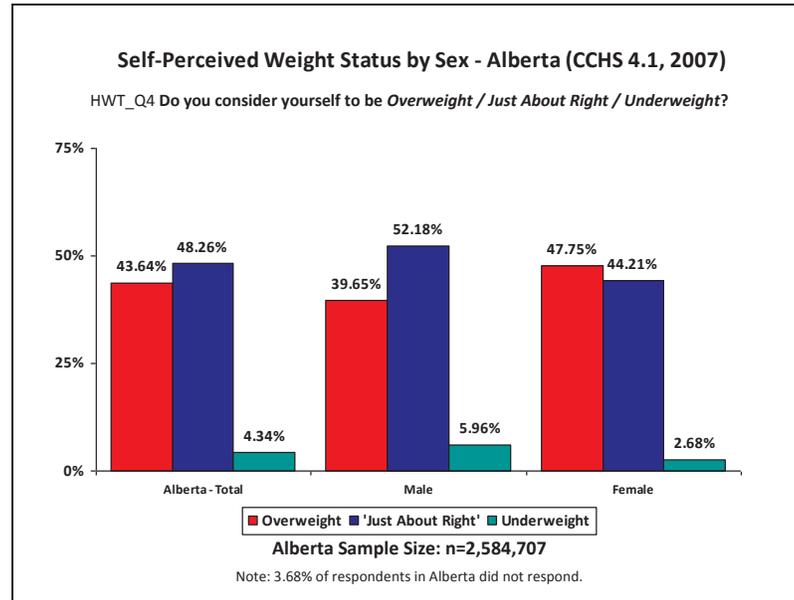
Compared to the overall provincial prevalence rate for overweight and obesity (50.1%), a significantly larger proportion of Albertan males were either overweight or obese when compared to female respondents (59.24% and 40.9%) (Figure 4.35).

Figure 4.35 - Overweight and Obese Weight Status as measured by Body Mass Index (BMI) among Albertans measured by Sex (CCHS 4.1, 2007)



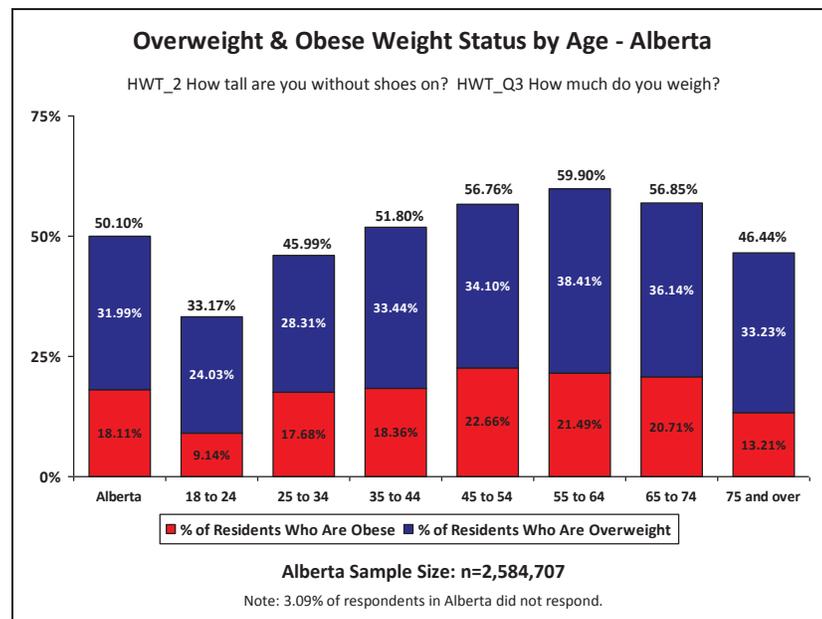
Albertan women were more likely than men to consider themselves as being either 'overweight' (47.8%) or 'just about right' (44.2%), while the majority of men considered their weight to be 'just about right' (52.18%) (Figure 4.36).

Figure 4.36 - Perceived Weight Status among Albertans measured by Sex (CCHS 4.1, 2007)



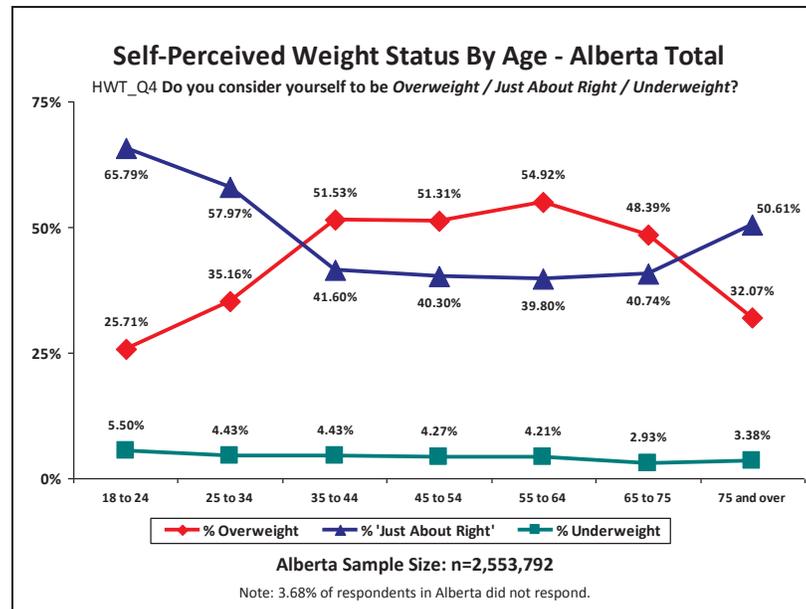
Measured by age, the combined prevalence of overweight and obesity increased with age, peaking at the 55 to 64 year old age bracket (59.9%), which was significantly higher than the overall provincial rate for all respondents 18 years and older (50.1%). The percentage of overweight and obese residents moderately decreased after the 55 to 64 year old group (Figure 4.37).

Figure 4.37 - Overweight and Obese Weight Status as measured by Body Mass Index (BMI) among Albertans measured by Age (CCHS 4.1, 2007)



A trend in the CCHS (4.1, 2007) data demonstrates how perceived weight status changes with age. As Albertans age they become less likely to perceive their weight as ‘just about right’ and more likely to consider themselves to be ‘overweight’. Albertans aged 55 to 64 years old are most likely to consider themselves to be ‘overweight’ (54.92%). The age group most likely to consider their weight to be ‘just about right’ are the youngest measured, between 18 and 24 years old (65.79%) (Figure 4.38).

Figure 4.38 - Perceived Weight Status among Albertans measured by Age



There was very little variation in the prevalence of overweight and obesity when measured by education level. Being overweight or obese was slightly more common among Albertans with the least amount of education measured - less than high school (55.41%) - and was lowest among those with only a high school education (46.20%) (Figure 4.39).

Similarly, there was very little variation in perceived weight status by the highest level of education attained. The proportion of Albertans who perceive themselves to be overweight increases with education, while the proportion who are ‘just about right’ decreases past the high school graduate level (Figure 4.40).

In contrast, there was a high degree of variation in both overweight and obesity individuals by household income as an upward trend is not evident until the \$30,000 to \$49,999 income bracket. Possibly the result of their low prevalence of leisure-time physical activity, the combined prevalence of overweight and obesity was highest in the \$80,000 or more income bracket (55.6%) (Figure 4.41).

No significant trends were observed for self-perceived weight status when measured by total household income. One-half (50%) of Albertans who earn more than \$30,000 per year consider their weight to be 'just about right' (Figure 4.42).

Figure 4.39 - Overweight and Obese Weight Status as measured by Body Mass Index (BMI) among Albertans measured by Highest Level of Education (CCHS 4.1, 2007)

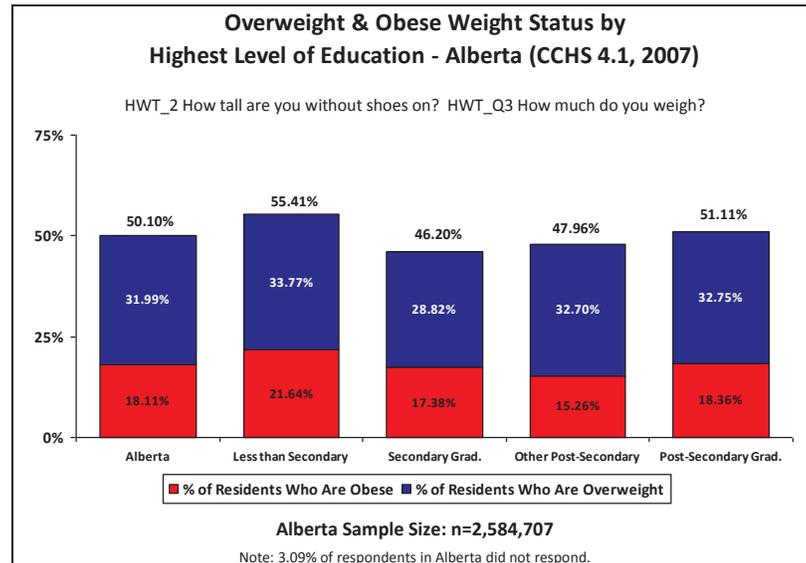


Figure 4.40 - Perceived Weight Status among Albertans measured by Highest Level of Education (CCHS 4.1, 2007)

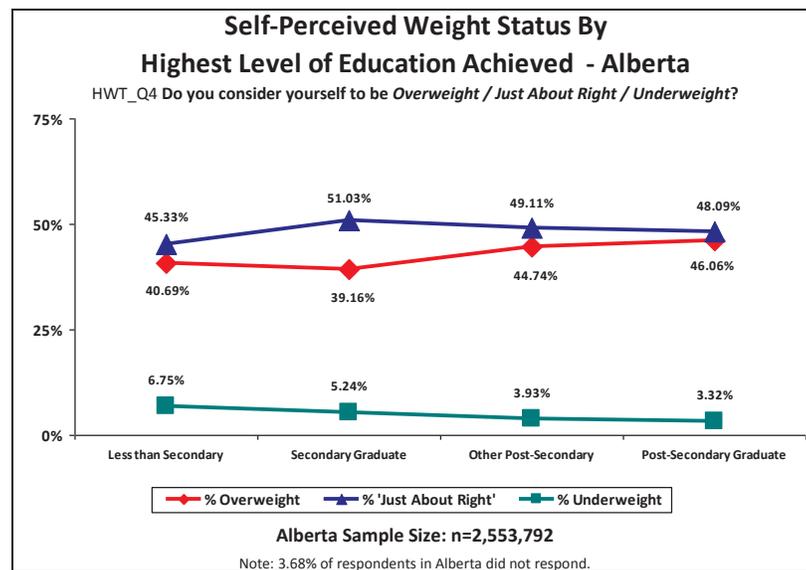


Figure 4.41 - Overweight and Obese Weight Status as measured by Body Mass Index (BMI) among Albertans measured by Highest Level of Education

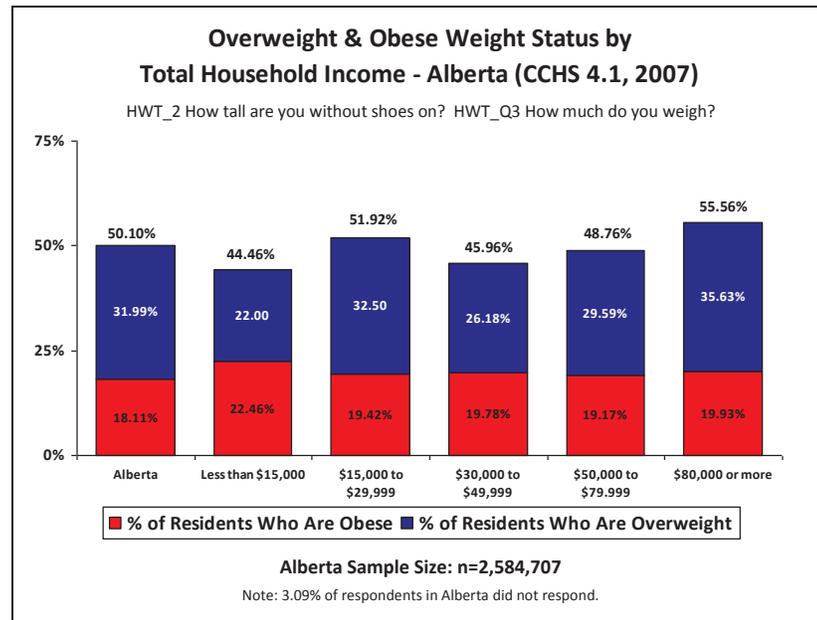
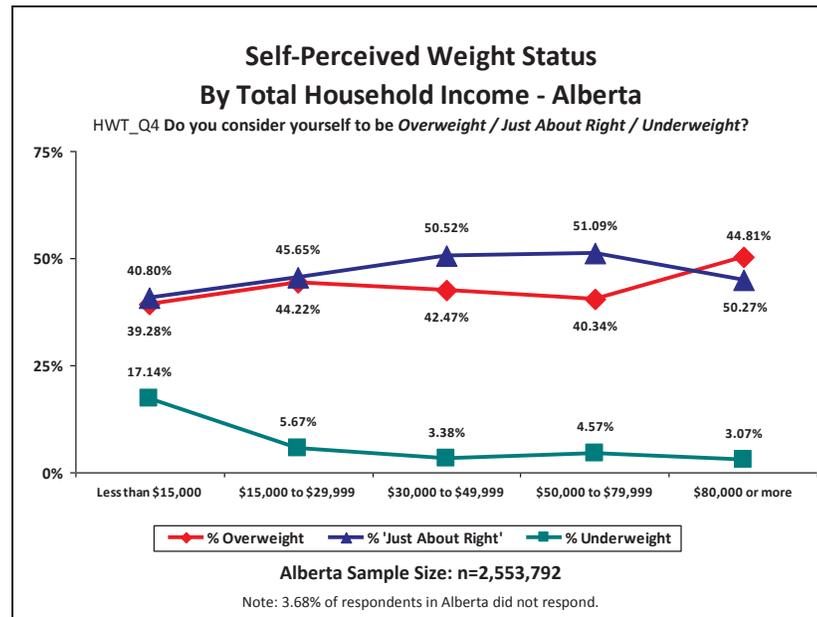


Figure 4.42 - Perceived Weight Status among Albertans measured by Total Household Income



Weight Management Summary

The information presented here represents the most recent population-level data on weight status (BMI) in Alberta. However, it is limited because it is based on self-reported weight and height data, which, when converted into BMI scores, is known to underestimate the true prevalence of overweight and obesity (Gorber, Tremblay, Moher, & Gorber, 2007). Research has shown that self-reported data tends to be overly subjective and that individuals are prone to underestimating their weight while overestimating their height (Gorber et al., 2007). By comparison, BMI calculations using weights and heights measured objectively by health professionals are more accurate (Gorber et al., 2007).

In 2004, weight status (BMI) data based on measured heights and weights collected by the CCHS found that the combined prevalence of obesity and overweight was 60.9% in all Albertan adults, which is substantially higher than the current 2007 prevalence calculated from self-report data (50.1%) (Statistics Canada, 2004c; Statistics Canada, 2008a). The prevalence of overweight and obesity (BMI) was also higher when estimated using measured weights and heights for both Albertan men (68.8% compared to 59.2% using self-report data) and women (52.9% compared to 40.9% using self-report data) (Statistics Canada, 2004c; Statistics Canada, 2008a). Accordingly, it is important to consider both measured and self-reported heights and weights to accurately determine the prevalence of overweight and obesity and to ensure that the validity and reliability of future comparisons.

Excessive body weight has been convincingly linked to increased risk of type 2 diabetes, heart disease and colorectal, breast, endometrial and kidney cancer, amongst others. It is recommended that both men and women try to be as lean as possible and maintain a body weight within the normal range (BMI of 21 to 23) (World Cancer Research Fund & American Institute for Cancer Research, 2007). One-half of Albertans were observed to be overweight and obese; the greatest prevalence of the two combined weight statuses occurred in Albertan men and the former regional health authorities of Peace Country HR, East Central HR and Aspen Regional Health Authority. Programs targeting weight reduction and management and obesity prevention initiatives are essential to address the behavioural, social and environmental factors that contribute to these unhealthy weight statuses.

It is of concern that many overweight (38.37%) and obese (9.70%) Albertans inaccurately considered their weight to be 'just about right'. Improving the ability of overweight and obese Albertans to recognize their weight status as having a potentially negative effect on their daily health and risk of chronic disease is a potential programming priority. Increased public exposure, through media and health promotion, to the known health risks of being overweight or obese may lead more overweight and obese individuals to accurately recognize their weight statuses (by BMI) (Johnson-Taylor, Fisher, Hubbard, Starke-Reed, & Eggers, 2008).

Summary & Conclusions

Overweight and obesity, poor diet and physical inactivity have been identified as major public health concerns in Alberta (Statistics Canada, 2008a). Over one-half of Albertans are overweight or obese (50.10%), and the majority of Albertans, overall and across all regions, consume an inadequate amount of vegetables and fruit per day. Moreover, slightly less than one-half (46.62%) of adults are not physically active enough to achieve and maintain a healthy body weight. An examination of current health perceptions, behaviours and body weight statuses in Alberta provides a starting point for utilizing and leveraging existing programmatic and policy efforts. Making additional strides to fill important organization and program vacancies for nutrition, physical activity, and weight management will also effectively contribute to reduced incidence and mortality of related disease in the future.

Chapter 5: Structures, Policies and Services (SPS)

Part 1—An Overview of Nutrition & Physical Activity Initiatives in Alberta

Key Points

- Environmental scans at the national, provincial and municipal levels reveal that many organizations operating within the province have priorities related to nutrition, physical activity, and healthy weights that align with those of Alberta Health Services. It is estimated that over 79 such organizations and 116 such programs are currently operating within the province.
- Nutrition-related initiatives tend to focus on the promotion of vegetable and fruit consumption, the promotion and sale of healthy foods, skill-building, and the provision of incentives to teach healthy eating and increase food security.
- Current programming trends for physical activity include the emergence of active transportation programs encouraging walking, cycling, and public transportation use, and targeted interventions directed at children and youth, young women, and middle-aged adults.
- Within Alberta municipalities, it is estimated that 5,477 programmatic and policy initiatives exist within 5 key focus areas, including parks and recreation infrastructure/programming (4,676 initiatives), transportation strategies (261 initiatives), community safety (144 initiatives), food and nutrition (140 initiatives), and healthy living and health promotion (256 initiatives).

Introduction - A Provincial Scan of Alberta

Organizational, programmatic and service-based approaches to chronic disease prevention should be evidence-based, flexible and include a strategic mix of possible actions. With evidence related to nutrition, physical activity and weight management constantly being produced and layered on top of the existing foundation, the most effective actions and opportunities for prevention programming in these areas can sometimes be unclear. In an effort to identify, utilize and promote the growth of existing organizations and programs across Alberta, a provincial environmental scan of nutrition and physical activity initiatives was conducted by the applied research team within the Public Health Innovation and Decision Support division (PHIDS) of Alberta Health Services with the following objectives:

- Develop an inventory of current organizations, programs and services related to nutrition, physical activity and weight management;
- Conduct a preliminary assessment of the initiatives' ability to support evidence-based partnerships and program development for chronic disease prevention ends; and,
- Identify missing information, resources and programs to propose strategic actions at the provincial, regional and municipal levels and fill program and research gaps.

The environmental scan identified organizations, programs and activities in various sectors - government (national, provincial, regional and municipal), non-government (NGO), and private - using relevant resources and methods of inquiry. Existing national and provincial databases, online information, and content from qualitative interviews conducted with key informants and stakeholders were examined. Accessing appropriate and relevant information at the provincial and regional levels was very straightforward, while assistance was needed to examine the municipal level. A separate municipal environmental scan was conducted, in collaboration with R.A. Malatest & Associates Ltd., among 129 cities, towns and other municipalities throughout Alberta. A corresponding review of federal, provincial and municipal strategies, policies and legislation related to nutrition, physical activity and healthy weights was also conducted and the results are presented in Chapter 6.

The information presented in this chapter is the current state of nutrition, physical activity and weight management organization and program-based work across Alberta. It begins with a review of national and provincial partners and programs and then presents an inventory of the work performed at the provincial, regional and municipal levels, respectively. At each level, there is a great deal of potential for leveraging existing programs and partnerships, as well as designing efforts that add value and fill significant gaps for improving nutrition and physical activity outcomes across the province.

National & Provincial Inventory

National organizations with provincial-level activities, as well as organizations with an exclusively provincial mandate were identified and acknowledged using existing databases and information provided by the Public Health Agency of Canada (PHAC) and Canadian Partnership Against Cancer (CPAC).

Public Health Agency of Canada – Canadian Best Practices Portal

Since 2006, the Public Health Agency of Canada (PHAC) has maintained the Canadian Best Practices Portal (CBPP), which has compiled a working inventory of national and provincial level interventions, practices and resources (Public Health Agency of Canada, 2008a). The PHAC portal identified 17 organizations that offer capacity building and knowledge exchange support services specific to nutrition and physical activity in Alberta (Figure 5.1). Of these seventeen, only four organizations are based in the province and all are, in some form, either supported or financially sponsored by the government of Alberta; they are:

- The Alberta Centre for Active Living;
- The Alberta Healthy Living Network;
- The Alberta Social and Health Equities Network – Growing Food Security in Alberta; and,
- Health in Action in Alberta (discontinued August 31, 2009).

National organizations recognized by the portal that offer support to chronic disease prevention decision-making and practice in Alberta include Health Canada, the Chronic Disease Prevention Alliance of Canada (CDPAC), Dietitians of Canada, and the Canadian Parks and Recreation Association.

Figure 5.1 - Capacity building and knowledge exchange support services available to support evidence-informed decision-making and practice in chronic disease prevention in Alberta (Public Health Agency of Canada, 2008a)

- Active Living Alliance for Canadians with a Disability
- Canadian Association for School Health / Canadian School Health Knowledge Network
- Canadian Parks and Recreation Association
- Chronic Disease Prevention Alliance of Canada
- Dietitians of Canada
- Health Canada
- Joint Consortium for School Health
- Lifestyle Information Network
- National Aboriginal Health Organization
- Physical and Health Education Canada
- Public Health Agency of Canada
- Vision Aboriginal Health Resource Directory
- Alberta Centre for Active Living
- The Alberta Social and Health Equities Network – Growing Food Security in Alberta
- Health in Action Alberta
- Canadian Obesity Network

Canadian Partnership Against Cancer

In March 2009, the Canadian Partnership Against Cancer (CPAC) completed a pan-Canadian environmental scan of primary cancer prevention activities that address modifiable risk factors for cancer and other chronic diseases (Canadian Partnership Against Cancer (CPAC), 2009a). The Alberta component of the scan revealed a large number of government-sponsored or organized primary prevention programs for nutrition, physical activity and weight management. Many of these programs are intended to address a single risk factor and are delivered using intersectoral collaboration, shared funding and partnership arrangements between specific government ministries and business units.

The CPAC scan revealed increased trends towards the promotion of vegetable and fruit consumption, the promotion and sale of healthy foods, skill-building initiatives, and the provision of incentives to teach and increase healthy eating and food security practices. An Alberta-based nutrition and healthy eating activity identified by the CPAC scan, which is regarded to be a model component of an effective nutrition strategy, are the Innovation Awards given by the Canadian Cancer Society, Alberta / NWT division to Alberta schools (Kindergarten to Grade 12) that make positive changes to their nutrition policies and recognizes teachers who go beyond the curriculum to inform students about healthy food choices.

Current programming trends for physical activity and active living include: the emergence of active transportation programs encouraging walking, cycling and public transportation to increase both physical activity and environmental sustainability; and targeted interventions to address specific populations with the greatest need, including children and youth, young women and middle-aged adults, that incorporate physical activities most people can easily perform during their leisure-time, such as walking.

Corresponding physical activity programs organized in Alberta include the Be Fit for Life (BFFL) network, Ever Active Schools, Go Girls / Girls in Motion, and Active Edmonton. All four programs sponsor year-round activities and events promoting physical activity as part of daily life, maintain interactive websites with a range of tools and resources enabling participants to plan and monitor their own fitness activities, and are, at least partially and, in some cases, fully, funded by the provincial government.

Provincial & Regional Inventory

In 2005, the Atlantic Health Promotion Research Centre (AHPRC), with funding from the Canadian Population Health Initiative (CPHI) of the Canadian Institute for Health Information (CIHI) conducted a comprehensive environmental scan of Healthy Eating and Active Living (HEAL) initiatives undertaken by governments – Federal, Provincial, and Territorial - across Canada (Atlantic Health Promotion Research Centre, 2005a). Building upon an original scan conducted in 2002, the 2005 scan was intended to identify and examine programs and policies (both formal and informal) that “encourage and support people and communities in making healthy eating and active living choices” and to inform the development of collaborative strategies with its findings.

The methodology of the HEAL Policy and Initiatives Scan consisted of 4 phases:

1. Telephone and Internet Scan;
2. Document Review;
3. Key Informant Interviews; and,
4. An Expert Panel Review

The same methods and phases were used by Public Health Innovation and Decision Support (PHIDS) to inventory provincial and regional physical activity and weight management organizations and programs across Alberta. Data collection for this component of the environmental scan occurred in two respective time periods: (i) September to December 2007; and (ii) November 2008 to January 2009. A selective and focused sampling technique was also used to select over 100 key informants and stakeholders currently working in a nutrition, physical activity, weight management and/or chronic disease prevention capacity. A total of 44 in-depth interviews were conducted with key informants from government, non-government and private sectors. The number of interviews and their high level of depth were sufficient to achieve data saturation using transcripts, interviewer field notes and background questionnaires. Given the high prevalence of nutrition, physical activity and weight management work being currently conducted in Alberta, the key informant sample size and response rate may seem low. However, small sample sizes are typical for most qualitative research (Auerbach & Silverstein, 2003; Mason, 2002). The sampling for this project was also strategically designed to engage as many key informants currently employed in formal healthcare, health promotion or intervention, and/or behaviour change capacities.

The results of organization and program inventory are not intended to endorse or promote any particular organization or program. The inventory data were also analyzed using the Population Health Promotion Model (Hamilton & Bhatti, 1996), the World Health Organization’s Ottawa Charter for Health Promotion (World Health Organization & Public Health Agency of Canada, 2005), and

criteria similar to that used by the HEAL scan (Atlantic Health Promotion Research Centre, 2005a).

Results: Provincial & Regional Inventory of Organizations and Programs

Across the province, there is a wide range of organizations from diverse sectors that deliver nutrition, physical activity and weight management programs to provincial, regional and specific at-risk populations²¹. It is estimated that over 79 organizations and 116 programs, targeting adults (18 years of age or older), are currently operating in Alberta. Most of these organizations also have objectives, activities and mandates that align with the Alberta Health Services' Population Health goals of targeting nutrition, physical activity and weight management to reduce disease incidence, mortality and burden. A distribution of organizations by primary area of focus is outlined in [Figure 5.2](#). While various commodity groups and food producers are listed here, it is expected that health is not their primary focus. The purpose of including these organizations in this inventory is to note their contribution to the food supply in Alberta. Additionally, food companies and industry groups provide Albertans with educational messages, and sometimes programs, related to nutrition. These messages must be considered when assessing the public's knowledge and perceptions related to nutrition, health and disease.

²¹ A program has been defined as a specific component or initiative developed and implemented through the efforts of an organization or independently from one.

Figure 5.2 - Distribution of Provincial Nutrition, Physical Activity and Weight Management Organizations in Alberta by Primary Area of Focus

Area(s) of Focus	Organizations
<p>Nutrition and Healthy Eating (n = 23)</p>	<p>Provincial</p> <p><i>Agriculture / Industry</i></p> <ul style="list-style-type: none"> • Alberta Barley Commission • Alberta Beef Producers • Alberta Canola Producers Commission • Alberta Chicken Producers • Alberta Egg Producers • Alberta Farm Fresh Producers Association (AFFPA) • Alberta Farmers' Market Association (AFMA) • Alberta Lamb Producers • Alberta Milk • Alberta Pork • Alberta Pulse Growers • Alberta Turkey Producers • Calgary Produce Marketing Association (CalPMA) • Growing Alberta <p><i>Government</i></p> <ul style="list-style-type: none"> • Alberta Agriculture, Food and Rural Development (AAFRD) <p><i>Not-for-profit</i></p> <ul style="list-style-type: none"> • Growing Food Security in Alberta (GFSA) <p>National</p> <p><i>Agriculture / Industry</i></p> <ul style="list-style-type: none"> • Canadian Produce Marketing Association (CPMA) <p><i>Government</i></p> <ul style="list-style-type: none"> • Health Canada (AB) • Canada's Food Guide • Food Labelling <p><i>Not-for-profit</i></p> <ul style="list-style-type: none"> • Canadian Association of Food Banks • Canadian Council of Food and Nutrition • Dietitians of Canada (Alberta and Territories region)
<p>Physical Activity and Active Living (n = 26)</p>	<ul style="list-style-type: none"> • Active Edmonton • Active Living Alliance for Canadian with a Disability • Active Living Coalition for Older Adults • Alberta Bicycle Association • Alberta Centre for Active Living • Alberta CSEP Health and Fitness Program • Alberta Fitness Leadership Certification Association • Alberta Provincial Fitness Unit / • Be Fit for Life Network • Alberta Education Physical Education Online • Alberta Recreation and Parks Association • Alberta Sport, Recreation, Parks and Wildlife Foundation • Alberta Tourism, Parks and Recreation • Alberta TrailNet • Canadian Association for the Advancement of Women in Sport and Physical Activity • Canadian Fitness and Lifestyle Research Institute • Canadian Parks and Recreation Association

Area(s) of Focus	Organizations
	<ul style="list-style-type: none"> • Canadian Society for Exercise Physiology (CSEP) • Coalition for Active Living • Health Canada – • Active Living at Work • InMotion Network • Lifestyle Information Network • ParticiPaction • Physical and Health Education Canada • Public Health Agency of Canada, Physical Activity Unit • Canada's Physical Activity Guide to Healthy Active Living • Safe, Healthy, Active People Everywhere • YMCA Canada • YWCA Canada
Weight Management (n = 1)	<ul style="list-style-type: none"> • Canadian Obesity Network – Alberta Chapter
Healthy Living: Nutrition & Physical Activity (n=25)	<ul style="list-style-type: none"> • Action for Healthy Communities • Alberta Centre for Injury Control and Research • Alberta Centre for Well-Being • Alberta Coalition for Healthy School Communities • Alberta Diabetes Foundation • Alberta Monitoring for Health Program • Alberta Health & Wellness • Healthy Living Branch • Alberta Healthy Living Network (AHLN) • Alberta Medical Association • Alberta Public Health Association (APHA) • Canadian Cancer Society - Alberta • Canadian Diabetes Association (Alberta Branch) • Community Education on Diabetes • Diabetes Management Education • Canadian Liver Foundation (Alberta Chapters) • Canadian Lung Association (Alberta Branch) • Canadian Mental Health Association (Alberta Branch) • Canadian Stroke Network • Centre for Science in the Public Interest • Chronic Disease Prevention Alliance of Canada (Alberta has stakeholders involved in CDPAC's Network of Provincial/Territorial Alliance) • Community Health Promotion Partnership • Health In Action • Heart and Stroke Foundation of Canada - Alberta, NWT & Nunavut • Heart Health Promotion • Living with Stroke Program • Juvenile Diabetes Research Foundation • Public Health Agency of Canada – Alberta • Southern Alberta Brain Injury Society • Support Groups • Victorian Order of Nurses – Health Promotion Clinics
Academic and/or Research (n=11)	<ul style="list-style-type: none"> • Alberta Consortium for Health Promotion Research & Education • Athabasca University • Science program of study: nutrition courses

Area(s) of Focus	Organizations
	<ul style="list-style-type: none"> • Bow Valley College • Nutrition Manager Certificate Program • Centre for Community Health Promotion Research • Calgary Institute for Population and Public Health • Northern Alberta Institute of Technology (NAIT) • School of Hospitality and Culinary Arts • Mount Royal College • Faculty of Health and Community Studies • Integrative Health Institute • Southern Alberta Institute of Technology (SAIT) • School of Health and Public Safety • University of Alberta • Faculty of Physical Education and Recreation • Faculty of Agricultural, Life and Environmental Sciences (Department of Agricultural, Food and Nutritional Science) • Faculty of Medicine and Dentistry • School of Public Health • Healthy Alberta Communities • University of Calgary • Faculty of Kinesiology • Faculty of Medicine: Departments of Health Sciences, Oncology, Community Health Science. • Faculty of Nursing • University of Lethbridge • Faculty of Health Sciences, Department of Public Health • Department of Kinesiology and Physical Education
<p>Aboriginal Health (n=8)</p>	<ul style="list-style-type: none"> • Aboriginal Capacity and Development Research Environments (ACADRE) • Aboriginal Healing Foundation • Aboriginal Mental Health (Alberta Health Services) • Aboriginal Network for Safe Communities • Alberta Native Friendship Centre Association • First Nations and Inuit Health Branch (Health Canada) • Métis Nation of Alberta • Métis Settlement General Council
<p>Other (n=5)</p>	<ul style="list-style-type: none"> • Alberta Association of Municipal Districts and Counties • Alberta Education • Alberta Human Ecology and Home Economic Association (AHEHEA) • Alberta Urban Municipalities Association (AUMA) • Go for Green
<p>Total - 99 Organizations</p>	

Various components of organization information, including activities, methods and settings, were also collected in order to determine their potential for partnering in population and public health initiatives for chronic disease prevention. The six action strategies of the World Health Organization’s (WHO) Ottawa Charter for Health Promotion were used to organize this information, including: build healthy public policy, create supportive environments, strengthen community action, develop personal skills, and reorient health services (World Health Organization & Public Health Agency of Canada, 2005) (Figure 5.3). Many of the organization-level key informants that were

interviewed acknowledged that the Ottawa Charter is a fundamental resource for their program planning and implementation.

Figure 5.3 - Nutrition, Physical Activity and Weight Management Organizations and Programs by Strategies of the Ottawa Charter for Health Promotion (World Health Organization & Public Health Agency of Canada, 2005).

Ottawa Charter Action Strategy	Number of Organizations / Programs	Examples of activities that are currently occurring in Alberta
Build Healthy Public Policy	55	Advocacy for policy, legislation, taxation and organizational changes for nutrition and physical activity.
Create Supportive Environments	33	Support for changes to the social and physical environments to support healthy eating, physical activity and other health promoting activities.
Strengthen Community Action	50	Partnerships to pursue and secure long-term funding for programs and projects, and evaluate program effectiveness.
Develop Personal Skills	39	Direct programming, information or education through social marketing and health promotion.
Reorient Health Services	38	Enhance nutrition, physical activity and weight management services in primary care and clinical settings.

A distribution and inventory of Alberta Health Services (AHS) nutrition, physical activity, weight management and disease-specific initiatives (current as of September 2009) by primary area of focus and by geographic region is outlined in [Figures 5.4](#) and [5.5](#). The distributions use regional subdivisions to compare the number of AHS initiatives that exist throughout the province. A summary of non-AHS programming is provided within the Municipal Program Inventory (see below). It should be noted that these distributions represent a single point in time, and that the information included was dependent on the individuals interviewed. With Alberta’s health system currently in a state of transition, it is possible that the distribution of these initiatives will change in the future.

Figure 5.4 - Regional Distribution of Alberta Health Services' Nutrition, Physical Activity and Weight Management Initiatives by Primary Area of Focus and Geographic Region (Current as of September 2009)

Area(s) of Focus	Regions									Total
	Northeast	Northwest	Yellowhead Corridor East	Yellowhead Corridor West	Central & Red Deer	Southeast	Southwest	Calgary	Edmonton	
Nutrition and Healthy Eating	2	4	2	2	3	4	2	7	5	31
Physical Activity and Active Living	-	3	-	1	1	1	-	2	6	14
Weight Management	1	1	-	-	-	-	-	1	2	5
Healthy Living	8	10	4	11	10	6	8	10	11	78
Aboriginal Health	2	1	1	1	2	1	3	3	1	15
Heart Health	-	3	3	2	3	3	2	13	15	44
Diabetes	-	1	1	1	1	1	-	5	6	16
Stroke	-	1	3	-	5	-	-	5	3	17
Total	13	24	14	18	25	16	15	46	49	220

Figure 5.5 - Inventory of Alberta Health Services' Nutrition, Physical Activity and Weight Management Initiatives by Primary Area of Focus and Geographic Region (Current as of September 2009)

Northeast – Northern Lights Health	Northwest – Peace Country Health
<ol style="list-style-type: none"> 1. Aboriginal Assertive Community Treatment Program (Aboriginal) Aboriginal Health Services (Aboriginal) 3. Addressing Poverty Program (Healthy Living) 4. Breast Feeding Support Program (Healthy Living) 5. Chronic Disease Prevention Program (Healthy Living) 6. Clinical Nutrition (Nutrition) 7. Community Health Services (Healthy Living) 8. Community Nutrition (Nutrition) 9. Health Promotion (Healthy Living; e.g., Action for Health Campaign) 10. Living Well with a Chronic Condition (Healthy Living) 11. Healthy Weights Program (Weight Management) 12. Public Health (Healthy Living) 13. Shifting to Wellness (Healthy Living) 	<ol style="list-style-type: none"> 1. Aboriginal Health Liaison Program (Aboriginal) 2. Active Independence: The Home Support Exercise Program (Physical Activity) 3. Alberta Aids to Daily Living (Healthy Living) 4. Become a Skilled Shopper Grocery Store Tour (Nutrition) 5. Breast Feeding Support Program (Healthy Living) 6. Cardiac Access Heart Function Clinic (Heart Health) 7. Cardiac Diagnostics (Heart Health) 8. Cardiac Rehabilitation Program (Heart Health) 9. Chronic Disease Prevention Program (Healthy Living) 10. Chronic Disease Self-Management Program (Healthy Living) 11. Clinical Nutrition (Nutrition) 12. Community Health Promotion (Healthy Living) 13. Community Nutrition (Nutrition) 14. Diabetes Prevention and Wellness Program (Diabetes) 15. Fit and Firm Challenge (Physical Activity; co-organized with the Be Fit For Life Network) 16. Health Education (Healthy Living) 17. Health Promotion (Healthy Living) 18. High Prairie Wellness Initiative Needs (HPWINS) (Healthy Living) 19. Living Well with a Chronic Condition (Healthy Living) 20. Nutrition Services (Nutrition) 21. Stroke Prevention Services (Stroke) 22. Walk On Program (Physical Activity) 23. Weight Loss for Life – Eat, Move & Live Well (Weight Management) 24. Work Place Health Presentations (Healthy Living)
Yellowhead Corridor East – East Central	Yellowhead Corridor West – Aspen
<ol style="list-style-type: none"> 1. Aboriginal Health Program (Aboriginal) 2. Cardiac Rehabilitation (Heart Health) 3. Cardiac Stress Testing (Heart Health) 4. Community Health Clinics (Healthy Living) 5. Community Nutrition Services (Nutrition) 6. Congestive Heart Failure Clinic (Heart Health) 7. Food for Thought Newsletters (Nutrition) 8. Diabetes Education (Diabetes) 9. Early Interventions (Healthy Living) 10. Health Promotion (Healthy Living) 11. Primary Stroke Centre (Stroke) 12. Public Health (Healthy Living) 13. Stroke and Geriatric Empowerment Unit (Stroke) 14. Stroke Prevention (Stroke) 	<ol style="list-style-type: none"> 14. Aboriginal Liaison Program (Aboriginal) 15. Breast Feeding Support (Healthy Living) 16. Cardiac Rehabilitation (Heart Health) 17. Cardiac Stress Testing (Heart Health) 18. Chronic Disease Management Program (Healthy Living / Chronic Disease) 19. Community Care Services (Healthy Living) 20. Community Health Services (Healthy Living) 21. Community Nutrition Services (Nutrition) 22. Diabetes Prevention (Diabetes) 23. Health Education (Healthy Living) 24. Health Promotion (Healthy Living) 25. Healthy Beginnings and Healthy Families (Healthy Living) 26. Living Well. Programs to Prevent and Manage Chronic Conditions (Healthy Living) 27. Nutrition Services (Nutrition) 28. Population (Public) Health Services (Healthy Living) 29. Recreation Outreach (Physical Activity) 30. Seniors Wellness (Healthy Living) 31. Shifting to Wellness (Healthy Living)

Edmonton – Capital Region

1. Aboriginal Diabetes Wellness Program (Diabetes)
2. Aboriginal Health Program (Aboriginal)
3. Active Anytime Anywhere (Physical Activity)
4. Active Edmonton (Physical Activity; co-organized with the City of Edmonton)
5. Adult Brain Injury Program (Stroke)
6. Adult Stroke Outpatient Rehabilitation Program (Stroke)
7. Adult Weight Management Clinic (Weight Management)
8. Anticoagulation Management Service (Heart Health)
9. Arrhythmia Clinic (Heart Health)
10. Built Environment (Healthy Living)
11. Cardiac EASE (Ensuring Access and Speedy Evaluation) (Heart Health)
12. Cardiac Intensive Care Unit (Heart Health)
13. Cardiac Rehabilitation Program (Heart Health)
14. Cardiac Sciences (Special Care Unit) (Heart Health)
15. Cardiology (Heart Health)
16. Cardiovascular Intensive Care Unit (Heart Health)
17. Cardiovascular Surgery Inpatient Unit (Heart Health)
18. Chronic Disease Community Network (Healthy Living)
19. Clinical Nutrition Programs (Nutrition)
20. Collective Kitchens (Nutrition)
21. Community Health Councils (Healthy Living)
22. Community Nutrition Services & Counseling (Nutrition)
23. Coronary Care Unit (CCU) (Heart Health)
24. Diabetes Education Centre (Diabetes)
25. Diabetes Information and Advice Line (DIAL) (Diabetes)
26. Diabetes Foot Clinic (Diabetes)
27. Diabetes Nephropathy Prevention Clinics (Diabetes)
28. Food Protection (Nutrition)
29. Fun & Fitness (Physical Activity)
30. Health Aids to Daily Living (Healthy Living)
31. Heart Function and Stabilization Clinic (Heart Health)
32. Heart Healthy Nutrition Class (Heart Health)
33. Hypertension Lipid Clinic (Heart Health)
34. Live Better Everyday (CDM) (Healthy Living)
35. Northern Alberta Renal Program (NARP) (Heart Health)
36. Population Health and Research (Healthy Living)
37. Public Health (Healthy Living)
38. Pulmonary Hypertension Clinic (Heart Health)
39. Reduce My Risk Program (Healthy Living)
40. Regional Diabetes Program (Diabetes)
41. Regional Nutrition and Food Services Education and Development (Nutrition)
42. Stress Testing Laboratory (Healthy Living)
43. Stroke Program and Clinic (Stroke)
44. Stretch & Strengthen (Physical Activity)
45. Syncrude Centre for Motion and Balance (Healthy Living)
46. Walk Edmonton (Physical Activity)
47. Walking to Wellness (Physical Activity)
48. Weight Wise (Weight Management)
49. Women's Health (Healthy Living)

Calgary Health Region

1. 24 Hour Blood Pressure Monitoring Service (Heart Health)
2. Aboriginal Health Program (Aboriginal)
3. Aboriginal Hospital Liaisons (Aboriginal)
4. Aboriginal Community Health Council (Aboriginal)
5. Acute Stroke Services (Stroke)
6. Aids to Daily Living (Healthy Living)
7. Brain Injury Rehabilitation Centre (Stroke)
8. Breast Cancer and Nutrition Program (Nutrition)
9. Cardiac Catheterization and Angioplasty (Heart Health)
10. Cardiac Function Clinic (Heart Health)
11. Cardiac Intensive Care / Coronary Care Units (Heart Health)
12. Cardiac Navigation Services (Heart Health)
13. Cardiac Rehabilitation (Heart Health)
14. Cardiovascular Laboratories (Heart Health)
15. Clinical Nutrition Services (Nutrition)
16. Collective Kitchens (Nutrition)
17. Community Health Services (Healthy Living)
18. Community Nutrition Services (Nutrition)
19. Congenital Heart Disease Services (Heart Health)
20. Diabetes Education (Diabetes)
21. Diabetes Prevention (Diabetes)
22. Diabetes Transition Services (Diabetes)
23. Diabetes, Hypertension and Cholesterol Services (Diabetes / Heart Health)
24. Diabetic Assessment and Treatment (Diabetes)
25. Eating for Your Life – The Best Nutrition for People with Cancer (Nutrition)
26. Exercising for Your Life – Activity Programs for People with Cancer (Physical Activity)
27. Health Promotion (Healthy Living)
28. Health Surveillance Services (Healthy Living)
29. Heart Health Services (Heart Health)
30. Heart Healthy Nutrition Class (Heart Health)
31. Healthy Living Unit (Healthy Living)
32. Inherited Metabolic Disorders Program (Healthy Living)
33. Nutrition Program (Nutrition)
34. Living Well with a Chronic Condition (Healthy Living)
35. Living with Cancer Series (Healthy Living)
36. Picky Eating (Nutrition)
37. Public Health (Healthy Living)
38. Pulmonary Rehabilitation (Heart Health)
39. Recreation Therapy Services (Physical Activity)
40. Respiratory / Pulmonary Medicine (Heart Health)
41. Stress Testing (Heart Health)
42. Stroke Prevention Clinic (Stroke)
43. Stroke Rehabilitation Clinic (Stroke)
44. TIA Reference Unit (Stroke)
45. Weight Management Program (Weight Management)
46. Wellness Services (Healthy Living)

Southeast – Palliser Region

1. Aboriginal Health Program (Aboriginal)
2. Cardiac Rehabilitation (Heart Health)
3. Cardiac Stress Testing (Heart Health)
4. Children’s Health and Developmental Services (Healthy Living)
5. Clinical Nutrition Services (Nutrition)
6. Community Health Councils (Healthy Living)
7. Community Nutrition Program (Nutrition)
8. Diabetes Education and Management Clinic (Diabetes)
9. Dial-a-Dietitian Service (Nutrition)
10. Health Promotion Services (Healthy Living)
11. Heart Healthy Nutrition Class (Heart Health)
12. Lactation Services (Healthy Living)
13. Living a Healthy Life with Chronic Conditions (Healthy Living)
14. Partners in Action – a Partner Community With Alberta Active Communities (Physical Activity)
15. Public Health Education (Healthy Living)
16. Public Health Nutrition Services (Nutrition)

Southwest – Chinook Region

1. Aboriginal Health Program (Aboriginal)
2. Action for Health (Aboriginal)
3. Breast Feeding Support (Healthy Living)
4. Building Healthy Lifestyles (CDM) (Healthy Living)
5. Cardiac Heart Function Clinic (Heart Health)
6. Cardiac Rehabilitation (Heart Health)
7. Clinical Nutrition (Nutrition)
8. Community Nutrition (Nutrition)
9. Diabetes Prevention Program (Healthy Living)
10. Families in Motion (Healthy Living)
11. Food Security Program (Aboriginal co-organized with the Blood First Nations)
12. Heartbeat of the Hat (Healthy Living – co-organized with the City of Medicine Hat)
13. Population Health (Healthy Living)
14. Wellness and Community Health (Healthy Living)
15. Women's Health (Healthy Living)

Central & Red Deer Area – DTHR Region

1. 49 Street Health Centre Aphasia Group (Stroke)
2. Aboriginal Health Program (Aboriginal)
3. Alberta Aids to Daily Living (Healthy Living / Chronic Disease)
4. Anticoagulation Clinic (Heart Health)
5. Breastfeeding Action Network (Healthy Living)
6. Cardiac Rehabilitation Clinics (Cardiovascular Disease)
7. Clinical Nutrition Services (Nutrition)
8. Community Aphasia Group (Stroke)
9. Community Health Services (Healthy Living)
10. Community Nutrition Services (Nutrition)
11. Diabetes Education Program (Diabetes)
12. First Nations Health Services (Aboriginal)
13. Halvar Jonson Centre for Brain Injury (Stroke)
14. Health Promotion (Healthy Living)
15. Heart Function Clinic (Heart Health)
16. Lifestyle Overhaul (Healthy Living; Co-organized with the City of Red Deer)
17. Living Well with a Chronic Condition (Healthy Living)
18. Moving and Choosing (Healthy Living)
19. Nutrition Services (Nutrition)
20. Public Health (Healthy Living)
21. Pulmonary Function Testing (Heart Health)
22. Recreation Therapy (Physical Activity)
23. Rise Up Red Deer (Healthy Living; Co-organized with the City of Red Deer)
24. Seniors Health Clinic (Healthy Living)
25. Stroke Prevention Clinic (Stroke)

The Alberta Primary Care Initiative

In 2003, Alberta Health and Wellness, the Alberta Medical Association and Alberta's Regional Health Authorities (now Alberta Health Services) established the Alberta Primary Care Initiative (PCI). Intended to "improve access to family physicians and other frontline health care providers in Alberta", the objectives of the PCI are to, through the development and operation of Primary Care Networks (PCNs):

- Increase the number of Albertans with access to primary care services;
- Manage access to appropriate round-the-clock primary care services;
- Increasing the emphasis on health promotion, disease and injury prevention, and care of patients with medically complex problems and/or chronic diseases;
- Improve the coordination of primary health services with other health care services including hospitals, long-term care and specialty care services; and,
- Foster a multidisciplinary team approach in the delivery of primary care.

According to the PCI website, "a PCN can be comprised of one clinic with many physicians and support staff, or several physicians in several clinics across a health region. Each network has the flexibility to develop programs and to provide services in a way that works locally to meet the specific needs of patients, while working within the provincial PCI framework. In PCNs, other health care professionals work closely with family doctors to enhance primary health services for patients." More than 60 per cent of all Alberta family physicians now work within a PCN. By 2011, the PCI has set the goal for 75 per cent of all Albertans to receive care from PCN teams.

At the date of this publication, there are 31 PCNs operating throughout Alberta with another 12 in the planning stages. Geographically, the former Capital Health Region (Edmonton district) has 8 PCNs (4 within the city, and 1 each in St. Albert, Fort Saskatchewan, Spruce Grove, Sherwood Park and Leduc), while the former Calgary Health Region has 7 PCNs operating within its boundaries (4 located within the city, with 1 each in Airdrie, Okotoks, and Canmore, respectively). In the former rural regions:

- The Northern Lights region has two PCNs (Northwest PCN in High Level and Wood Buffalo PCN in Fort McMurray);
- The Peace Country region has three PCNs (Peace River PCN, Sexsmith PCN, and West Peace PCN in Hythe);
- The Aspen Regional Health Authority has two PCNs (Bonnyville PCN and St. Paul PCN);

- The East Central Region has two PCNs (the Provost/Consort PCN and Camrose PCN);
- The David Thompson Health Region has four PCNs (Big Country PCN in Trochu, Wolf Creek PCN in Lacombe, the Red Deer PCN, and the Rocky Mountain House PCN)
- The Palliser and Chinook regions have one PCN each, the Palliser PCN in Medicine Hat and the Chinook PCN in Lethbridge, respectively.

With the reorganization of the nine regional health authorities into five health zones, partnerships with the existing and future PCNs will likely be vital to the success of the chronic disease prevention initiatives across the province.

Results: Emergent Themes from the Provincial & Regional Level Inventory

The key informant interview data collected for the provincial and regional inventory was also analyzed qualitatively using a categorical indexing approach for prevailing themes and uniformity in responses (Auerbach & Silverstein, 2003; Mason, 2002). An indexing system was developed to identify common principles and processes performed by informants and stakeholders in their nutrition, physical activity and weight management work. The analysis was performed until consistent emergent themes were identified and organized into the following groups:

- Provincial Health Goals Related to Nutrition, Physical Activity and Weight Management
- Target Populations, Settings and Concentrations
- Shared Responsibility and Participation in Program Design, Delivery and Evaluation
- Stability of Funding and Governance

Provincial Health Goals Related to Nutrition, Physical Activity and Weight Management

From a population health perspective, health represents “the capacity of people to adapt to, respond to, or control life’s challenges and changes” (Frankish, 1996). Many key informants noted that one of the most challenging aspects of their work involves influencing Albertans to be more proactive in their health and to become more active partners in their own individual health care planning and decision-making. Informants also agreed that the involvement of health consumers in policy planning, self-help and mutual aid is an integral part of the promoting healthy eating and physical activity to enhance the health status of all Albertans. Both of these issues appear to reflect the need for the Albertan public to be further encouraged to contribute to a healthy province by adopting

and maintaining a nutritious diet, regular physical activity and a healthy body weight.

All 44 key informants were involved in health, nutrition, physical activity or weight management organization or program planning, designed for and delivered to a specific target population and/or for the entire population at a provincial or regional level. Most informants also conducted their program planning and delivery of services using population health frameworks, such as the Ottawa Charter for Health Promotion (World Health Organization & Public Health Agency of Canada, 2005) or the Population Health Promotion Model (Hamilton & Bhatti, 1996). Very few informants were directly involved with the primary care of patients, and those who were, incorporated larger public or population health goals within that work.

There was a recognition that the measurement and monitoring of Albertans' diets, activity levels and body weights needs to be drastically improved. Several informants conveyed that goals and benchmarks need to be SMART (Specific, Measurable, Attainable, Realistic and Timely) and make use of existing tools such as data from the Canadian Community Health Survey (CCHS 4.1, 2007) and others to understand behaviour, as well as the knowledge, attitudes and beliefs of Albertans with respect to nutrition and physical activity.

The findings of the provincial and regional inventory demonstrate that population goals for nutrition, physical activity and weight management need to:

- Incorporate existing and innovative population and public health frameworks that are tested and proven to be effective in Alberta context;
- Include opportunities for public input and feedback for the health-care decision-making and policy planning; and,
- Improve how nutrition, physical activity and weight-related health behaviours are measured and monitored as short and long-term means of improving the health outcomes and chronic disease risk of Albertans, overall and among target groups.

Target Populations, Settings and Concentrations

Most initiatives in the provincial and regional inventory were targeted towards groups at a high risk for illnesses and chronic diseases because of poor nutrition, physical inactivity, overweight and obesity. These groups included children and youth, and the province's Aboriginal population. Settings in which programs and interventions are most likely to be delivered for children and youth include schools and community centres, whereas Aboriginal-focused programming is often set within facilities located on reserve land.

Adults aged 18 to 65 years old are rarely the main target population of nutrition and physical activity programs across the province. A great deal of work in the two areas is concentrated on obesity prevention for children and youth, and adults are not regarded to be at risk for obesity to the same extent as the under-aged population. Interventions targeting adults often involve a family or community component and are likely to take place within households or workplaces. As data from the 2007 Canadian Community Health Survey suggests, interventions aimed at improving the weight status and daily vegetable and fruit intake of Albertan adults are currently needed (Statistics Canada, 2008a).

In terms of their respective concentrations, some initiatives are singularly focused on nutrition, physical activity or weight management, while others plan or implement services that are focused on any combination of the three. For initiatives with an integrated focus, weight management and healthy body weights are often regarded as a byproduct of improved nutrition and physical activity behaviours. While some programs do include a focus on chronic disease prevention, none are focused on specific diseases. However, most informants who are directly involved in health care service planning and delivery were receptive to the idea that their programs, initiatives and directives could lead to disease preventive effects for their clients, patients, participants and/or target populations.

Shared Responsibility and Participation in Program Design, Delivery and Evaluation

Another emergent theme from the provincial scan was the importance of sharing responsibility for the improvement of nutrition and physical activity outcomes and health behaviours by creating and sustaining provincial, regional and local partnerships. Ideally, these partnerships should serve two functions: first, to promote and facilitate integrated, multi-method approaches to program delivery, policy planning and evaluation, and health promotion messaging across multiple contexts; and second, achieve short-term, intermediate and long-term objectives to mobilize and empower communities and individuals to contribute to a unified vision of improved nutrition, physical activity and weight-related outcomes across the province.

It was also recommended that existing partnerships should be fostered, while new partnerships need to be coordinated and developed with the support of a provincial-level organization with a high degree of influence, reach and credibility to facilitate discussions of shared visions, policies and strengths. As a result of conducting this environmental scan, most informants believed Alberta Health Services' Health Promotion, Disease and Injury Prevention (at the time of

data collection, the Alberta Cancer Prevention Program) should assume this role and act as the link between current initiatives, promoting and building upon their respective and shared successes, while avoiding the duplication or reemergence of efforts that were found to be ineffective. An increase in research and program efforts that include policy components and are aimed to specific groups was also recommended to enhance long-term outcomes and create sustainable, manageable partnership arrangements for nutrition, physical activity and weight-related behaviour change.

Stability of Funding and Governance

One of the most prevalent and long-standing challenges faced by many key informants is limited funding and resources to support population-based (provincial and regional) programs and initiatives. For both organizations and programs, inadequate funding is intricately linked to currently low staffing rates and limited capacity. Staff shortages were also regarded by some informants as a challenge to expanding the scope of initiatives and providing Albertans, especially residents of rural areas, with greater access to programs, services, facilities and infrastructure.

Stability of funding was regarded by most to be a prerequisite for the provision of effective health services, health planning and service delivery. To overcome the challenges related to funding, it was recommended that the organization, staffing and costs of programming need to be shared through partnerships between organizations with similar focuses and long-term goals, possibly organized and influenced by a provincial-level organization with reach and capacity in regional and municipal settings.

Municipal Inventory

In addition to the organization and program inventory, an environmental scan of 129 Alberta municipalities, including 16 cities, 109 towns and 4 specialized municipalities was conducted. Within each municipality, existing programs, policies and infrastructure aimed at engaging citizens in healthy eating, being physically active and living healthier lifestyles were identified. Conducted in collaboration with R.A. Malatest & Associates Ltd., the purpose of this work was to assess the potential to build upon local initiatives and use existing resources for chronic disease prevention outcomes at the municipal level (Alberta Health Services – Cancer Prevention Program & R.A. Malatest & Associates Ltd., 2009). A reproduction of the municipal report can be provided by the Public Health Innovation and Decision Support division (PHIDS) by request.

Overall, the municipal scan resulted in 5,477 identified program and policy components, which were organized into five areas of interest, including:

- Parks and Recreation Infrastructure and Programming;
- Transportation Strategies;
- Community Safety Initiatives;
- Food and Nutrition Initiatives; and,
- Healthy Living and Health Promotion Strategies.

Detailed explanations of the five initiative areas are further described below.

Parks and Recreation Infrastructure and Programming

When a community has adequate parks and recreation infrastructure it becomes much easier to choose and maintain an active lifestyle during their leisure-time. Recreation initiatives and infrastructure appear to be the most prevalent and well-established forms of nutrition, physical activity and weight management work at the municipal level throughout Alberta. In total, 4,676 parks and recreation facilities and programs have been adopted across the 129 municipalities reviewed. All municipalities have a variety of parks and recreation initiatives currently in place; most are in the form of recreational facilities and infrastructure, including sports parks, hockey arenas or aquatic centres. There is also a great deal of physical activity programming work that is organized for children, adults and seniors to be physically active during their leisure-time. However, initiatives that promote and support physical activity at home and work, as well as a mode of transportation have not been implemented in most Albertan communities.

Transportation Strategies

Transportation strategies serve two functions for healthy living: (i) to encourage non-motorized forms of transportation such as bicycling or walking; and (ii) to reduce motor vehicle pollution through the use of public transportation and car-pooling. In total, 261 transportation strategies were identified in the scan. The current transportation strategies across Alberta's municipalities are a mix of innovative transportation initiatives and funding to maintain or improve traditional physical infrastructure. This mix includes specific transportation strategies to encourage the use of public transportation, to promote non-motorized active transportation by walking or bicycle-use, and improve or maintain existing roadways. Yet while many communities, regardless of their population size, have non-motorized transportation infrastructure, such as walking or bike paths, few actively promote non-motorized transportation choices or options.

Community Safety Initiatives

The focus of community safety initiatives is to prevent or reduce the social and environmental factors that affect people's right to live and be active without fear of crime or injury and, as a result, increase their quality of life. Safe communities also promote the overall community aesthetic and atmosphere to encourage and support outdoor physical activity and recreation. Specific community safety strategies may include safe routes to schools, public routes that have infrastructure for violence or crime prevention, or safety education programs to teach preventative measures and safety tips to municipal residents.

In total, 144 community safety strategies have been adopted by Albertan municipalities. However, the absence of formal community safety plans or initiatives in most municipalities is a significant gap province-wide. The smaller the municipality, the less likely it has a community safety initiative in place. As expected, safe natural and built environments that have unobstructed views and adequate lighting are a priority across municipalities. The low incidence of community safety initiatives, in general, suggests the need for a provincial municipal-community safety strategy to assist communities in the development and implementation of formal community safety plans.

Food and Nutrition Initiatives

Lack of access to healthy foods is an obvious barrier to achieving and maintaining a healthy diet, especially when unhealthy foods are highly accessible. Currently, 140 food and nutrition strategies have been adopted by various municipalities across the province. Most of these strategies are focused on alternative food sources such as farmer's markets, specialty stores, or

organic gardening, while there are significant gaps in food and nutrition programming at the municipal level to promote healthy eating, portion sizing and nutrition labeling.

Healthy Living and Health Promotion Strategies

Directly promoting healthy living can take many forms. Programs can encourage healthy lifestyles or the environments that support them, help individuals achieve and maintain a healthy body weight, limit alcohol consumption, support breastfeeding, and/or assist environmental protection and conservation. In total, 256 healthy living strategies have been adopted in municipalities across Alberta, with the greatest number focused on environmental protection and conservation (n=170). There are gaps, however, in other areas. For instance, most municipalities do not have any policies or programs in place that focus on healthy body weight (n=5), guidelines that pertain to alcohol consumption (n=2), or support breastfeeding (n= 5).

As summarized in [Figure 5.6](#), the municipal scan demonstrates how the most identifiable initiatives in Alberta are Parks and Recreation Infrastructure and Programming, with 100.0% of municipalities having one or more of these initiatives in place.

The least implemented initiatives are those that address Community Safety. Approximately one-half (49.6%) of municipalities were found to have these initiatives.

Figure 5.6 - Percentage of Municipalities with Initiatives by Type and by Region

Regions	Parks & Recreation Infrastructure and Programming	Transportation Strategies	Community Safety Initiatives	Food & Nutrition Initiatives	Healthy Living and Health Promotion Strategies
South Region (n=26)	100.0%	57.7%	57.7%	30.8%	38.5%
Calgary Region (n=12)	100.0%	75.0%	58.3%	66.7%	75.0%
Central Region (n=37)	100.0%	62.2%	37.8%	54.1%	56.8%
Edmonton & Capital Region (n=13)	100.0%	76.9%	76.9%	84.6%	92.3%
Northwest Region (n=24)	100.0%	62.5%	54.2%	50.0%	45.8%
Northeast Region (n=17)	100.0%	76.5%	29.4%	41.2%	47.1%

Transportation Strategies (57.7%), Food and Nutrition Initiatives (30.8%), as well as Healthy Living/Health Promotion Strategies (38.5%) were least prominent in the South Region.

Communities within the Northeast Region were least likely to have Community Safety Initiatives (29.4% of municipalities).

Municipalities in the Edmonton & Capital Region and in the Calgary Region were most likely to have initiatives in place in all five areas.

The percentage of municipalities with initiatives in place generally increased with community size, with the exception of Food and Nutrition Initiatives. As highlighted in [Figure 5.7](#), small municipalities (population under 5,000) were least likely to have initiatives in all areas, except for Parks and Recreation Infrastructure and Programming and Food and Nutrition Initiatives.

Figure 5.7 - Percentage of Municipalities with Initiatives by Type and by Size of Population

Municipality Size	Parks & Recreation Infrastructure and Programming	Transportation Strategies	Community Safety Initiatives	Food & Nutrition Initiatives	Healthy Living/Health Promotion Strategies
Under 5,000 (n=76)	100.0%	52.6%	38.2%	40.8%	35.5%
5,001 – 20,000 (n=43)	100.0%	81.4%	60.5%	69.8%	76.7%
20,001 – 50,000 (n=3)	100.0%	100.0%	66.7%	33.3%	100.0%
50,001 – 100,000 (n=5)	100.0%	100.0%	100.0%	60.0%	100.0%
Over 100,000 (n=2)	100.0%	100.0%	100.0%	100.0%	100.0%

For some municipalities, partnerships with other levels of government, and/or with other community stakeholders, such as not-for-profit organizations or professional associations, were instrumental in the community’s ability to implement certain initiatives. The presence of partnerships addressing one or more of the five initiative areas were identified in 31.0% of Alberta communities²².

On the regional level, partnerships were most prominent in the Edmonton & Capital Region with 69.2% of municipalities explicitly identifying partnerships, followed by the Calgary Region, with 50.0% of municipalities involved in partnerships. Communities in the South Region were least likely (15.4%) to have initiatives that were achieved through partnerships. Partnerships were least frequent in municipalities with populations under 5,000, with only 18.4% of the municipalities reporting at least one partnership. In total, 83 programs and/or infrastructure initiatives achieved by means of partnerships with other levels of government or with community stakeholders were found as a result of the scan.

Overall, the environmental scan yielded 5,915 municipal policies, programs, infrastructure and initiatives in existence in Alberta. [Figure 5.8](#) shows the relationship between the total number of initiatives by the five areas of interest and the six economic-geographic regions.

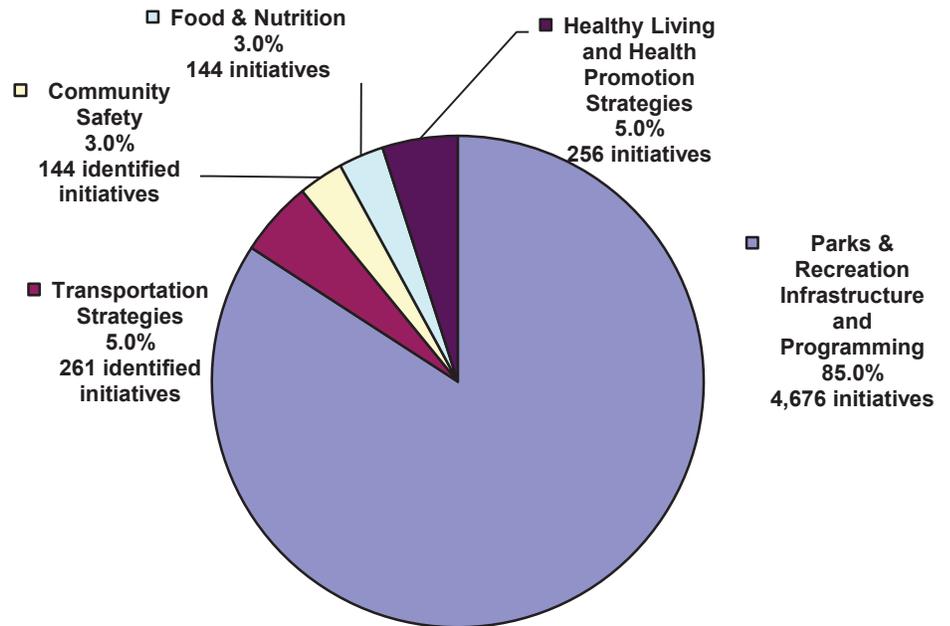
Figure 5.8 - Overall Municipal Initiatives by Region

Initiatives	South Region	Calgary Region	Central Region	Edmonton & Capital Region	Northwest Region	Northeast Region
Parks & Recreation Infrastructure and Programming (n=5,112)	609	1,722	795	1,109	173	404
Transportation Strategies (n=261)	24	67	61	58	32	19
Community Safety Initiatives (n=144)	20	17	35	34	29	9
Food & Nutrition Initiatives (n=142)	11	22	38	41	19	11
Healthy Living / Health Promotion Strategies (n=256)	21	50	90	55	27	13
TOTAL INITIATIVES (n=5,915)	685	1,878	1,019	1,297	580	456

²² This may be an underestimate given that partnerships were identified on the basis of information provided in documentation and information contained on municipal websites.

A summary of the total number of initiatives, with an overview of current municipal priorities and recommendations, by the five areas of interest is presented in [Figure 5.9](#).

Figure 5.9 - Distribution of Initiatives across Alberta's Municipalities by Areas of Interest²³



²³ Physical activity programming activities account for 3,087 initiatives, which equates to 66% of all parks and recreation infrastructure and programming. An additional 1,564 initiatives are public parks and recreational facilities (33%), while initiatives that support physical activity – at home, work, and as mode of transportation – and promote walking account for the remaining 56 or 1% of municipal initiatives.

Summary & Conclusions

The objectives of this chapter were to inventory current organizations, programs and services related to (i) nutrition, physical activity and weight management, (ii) conduct a preliminary assessment of initiatives to support evidence-based partnerships and program development efforts, and (iii) identify missing information to fill programmatic and research gaps. The results of the respective scans suggest that while many nutrition, physical activity and/or weight management programs and services are currently being offered across the province, very few operate under a mandate for chronic disease prevention. Programs aimed at improved health and quality of life outcomes can provide important partnership and sponsorship opportunities in order to impact the prevention of chronic disease among both specific and general target populations.

As a whole, the findings of this chapter present a “snapshot” of activities in Alberta, during a period of great transition and change in the healthcare delivery throughout the province. To a large extent, it was difficult for some key informants from the provincial-regional inventory to fully articulate their efforts because of an uncertainty over the future of their organization and programs’ funding. This sense of uncertainty was especially prevalent among representatives interviewed on behalf of the former nine regional health authorities, which will soon be fully transitioned into five core districts. In this climate of change, coordinated and linked efforts are necessary for policy, research and programming initiatives and their affiliated outcomes to be successful. These efforts should begin with fostering existing stakeholder relationships and further investigation to identify new partners who work in provincial, regional and municipal capacities.

Chapter 6: Structures, Policies and Services (SPS)

Part 2—Strategies and Policies

Key Points

- The Public Health Agency of Canada’s Integrated Strategy on Healthy Living and Chronic Disease provides a framework upon which to build collaborative and inter-sectoral chronic disease prevention programmatic, policy, and research initiatives. Included in this strategy are:
 - The Canadian Strategy for Cancer Control
 - The Canadian and Alberta Diabetes Strategies
 - The Canadian Heart Health Strategy
 - The Canadian and Alberta Stroke Strategies
- Currently in Alberta, there are no comprehensive nutrition and/or weight management strategies at the population level. The Alberta Active Living Strategy (1997) was established by the Alberta Ministry of Community Development to increase physical activity within the population.
- Broad-level policies targeting the environmental, social and economic factors that influence individual-level behaviours related to nutrition, physical activity and weight management are necessary in the prevention of chronic disease. Currently, Alberta has made some progress in the area of physical activity policy through the establishment of the Active Living Strategy, and the passing of Bill 206 (Physical Activity Credit, yet to be implemented). Nutrition-related policy in Alberta has primarily targeted children and youth rather than adults, which is an important gap in chronic disease prevention activities.

Introduction

The aims of this chapter are to (i) review past and present strategic initiatives directed at healthy living and chronic disease prevention and (ii) assess the state of physical activity and nutrition policy in Alberta by examining federal, provincial, municipal policies and legislation. Past federal, provincial, and municipal strategies and policies pertaining to these areas have lacked uniformity and were championed by disjointed stakeholders, creating a piecemeal policy structure in its wake. Public health policy is any work that seeks to “improve or enhance the health of the population and reduce health disparities” through legislative action at the local, provincial or federal levels (Government of Canada Senate, 2008). The role of healthy public policy in creating effective and long-term strategic and systemic change cannot be discounted, as it remains one of the most effective means to prevent chronic disease (World Cancer Research Fund & American Institute for Cancer Research, 2007).

The World Health Organization’s Regional Strategy and Action Plan for an Integrated Approach to Prevention and Control of Chronic Diseases, including Diet, Physical Activity, and Health

In 2006, the World Health Organization published its North American strategic action plan for the prevention and control of chronic diseases. Using a life course perspective to guide program and policy planning, the North American strategic plan recognizes that disease risk is affected by environmental, economic and social factors, in combination with behavioural and biological processes that can occur throughout all stages of life. In view of that perspective, the action plan states that (i) direct preventive interventions against chronic disease are required as early in life as possible and (ii) intersectoral collaboration needs to occur between the health, education, communication, agriculture, transportation, economic, and trade sectors to achieve the best possible preventive outcomes (Pan American Health Organization (PAHO) & World Health Organization (WHO), 2006).

With the potential for it to be applied in national, provincial and regional contexts, the WHO action plan specifies strategic approaches for action (Figure 6.1).

Figure 6.1 - The World Health Organization’s Strategic Approaches for Action to Prevent and Control Chronic Diseases (Pan American Health Organization (PAHO) & World Health Organization (WHO), 2006)

Strategic Approaches	Strategies for Action
Advocacy for policy changes and development of effective public policy	<ul style="list-style-type: none"> • Technical cooperation between sectors must be encouraged and provided to create public policies that support health status and the minimization of chronic disease-related disability. • Policies must address the broad social, economic and political determinants of health and reflect the values of equity, social justice and integrity, amongst others. • Advocacy must be utilized to advance policy and institutional changes to support chronic disease programs.
Build capacity for community-based actions	<ul style="list-style-type: none"> • Public health strategies need to: <ul style="list-style-type: none"> • Include community-based actions that influence changes within communities to promote healthy lifestyle and prevent obesity; • Focus on community interventions that build supportive environments for risk factor reduction; • Mobilize communities to change institutional policies.
Strengthen health services for integrated prevention and management of chronic diseases	<ul style="list-style-type: none"> • Integrated prevention involves interventions that simultaneously prevent and reduce a set of common modifiable risk factors. • The management of chronic diseases requires integration of services through strengthened referral and relationships among primary, secondary and tertiary levels of care. • Management should cover prevention, screening and early detection, diagnosis, treatment, rehabilitation and palliative care.
Reinforce the competencies of the health-care workforce for chronic disease prevention and management	<ul style="list-style-type: none"> • The skills of health professionals must be expanded to address the complexities of chronic conditions with a team approach. • The importance of continuing education for the health-care workforce to reinforce competencies for patient-centered care must be emphasized. • Continuous quality-improvement methods which effectively use information and communications technology should be utilized.
Create Multisectoral Partnerships and Networks for Chronic Disease	<ul style="list-style-type: none"> • Dialogue must be facilitated and partnerships built between multisectoral stakeholders, including governmental and nongovernmental agencies, professional associations, academic institutions, civil society, patients’ groups and people affected by chronic diseases to establish effective policies and programs for chronic disease prevention.
Build Capacity for Chronic Disease Information Generation and Knowledge Management	<ul style="list-style-type: none"> • Timely and accurate information and surveillance on risk factors, chronic disease occurrence, distribution and trends is essential for policy-making, program planning and evaluation. • Integration must occur among multiple data sources in order to access the complete range of information to determine the status of chronic diseases. • Information must be analyzed, synthesized, and disseminated at multiple levels (national, provincial and regional)

The WHO maintains that all of the above strategic approaches are interdependent and need equal prioritization to reach all sectors of the population and achieve the prevention and reduced burden of chronic disease and related nutrition, physical activity and weight management risk factors. However, in order for the plan to potentially be applied to the Alberta context, further consideration of Canadian and Albertan strategies is required.

The Public Health Agency of Canada's Integrated Strategy on Healthy Living and Chronic Disease

In 2005, the Public Health Agency of Canada implemented its Integrated Strategy on Healthy Living and Chronic Disease. Considered “a historic step forward” in Canadian health promotion and disease prevention”, with federal financial contributions of \$300 million over five years (2005-2010) and \$74.4 million per year, the Integrated Strategy aims to: improve collaboration among organizations, jurisdictions and sectors; allocate funds for disease-specific investments for cancer, diabetes and cardiovascular disease; provide a comprehensive framework to address physical and social environments, and risk factors and conditions; and contribute to stronger public policies and more integrated, evidence-based and responsive health systems. Accordingly, the three interrelated and action-oriented pillars of the Integrated Strategy are:

- Promoting health by addressing the conditions that lead to unhealthy eating, physical inactivity and unhealthy weights;
- Preventing chronic disease through focused and integrated action on major chronic diseases and their risk factors; and
- Supporting the early detection and management of chronic diseases.

Within the broader framework of the Integrated Strategy there are also disease-specific strategies to address cancer, diabetes and cardiovascular disease. Funded by the Public Health Agency of Canada, each of these strategies has its own separate objectives and strategic initiatives. Each also functions as “an observatory of best practices” where experiences can be compared and evaluated to benefit chronic disease prevention and healthy living promotion efforts overall.

The Canadian Strategy for Cancer Control

The Canadian Strategy for Cancer Control (CSCC) was established in 1999 to be “a coordinated, comprehensive approach to managing cancer” both nationally and provincially. Jointly developed by the federal government in collaboration with the provinces, territories and non-governmental cancer organizations, the initial objectives of the CSCC were to: allow each province to independently build its own cancer care management system using data and knowledge

produced across the country; and enable cancer experts, health professionals and individuals to manage cancer effectively and efficiently across Canada and in local communities.

With an investment of \$59.5 million over five years made by the Integrated Strategy in 2005, the CSCC has been able to move its agenda forward and establish strategic investment areas that represent a comprehensive approach to cancer control and are flexible, responsible and forward-thinking. The investment areas are:

- **Cancer Prevention and Early Detection:** the main objective of this area is to develop and foster a pan-Canadian primary prevention system that supports evidence-based practice for policies and programs and addresses the population-based risk factors for cancer;
- **Supporting the Cancer Patient's Journey:** in collaboration with partners, the strategy offered community-based resources and web-based tools to patients to help them navigate the complexities of cancer treatment and support the skill sets of health practitioners to be better prepared to help patients;
- **Supporting the Cancer Workforce:** the main objectives of this area are to develop a coordinated pan-Canadian workforce strategy to address issues of repatriation, recruitment, retention and training, and provide standards-based tools to help provinces plan for cancer human resources and capital equipment demands;
- **Encouraging Cancer Research:** the main objectives of this area are to establish a pan-Canadian cancer research network to coordinate funding, foster the transfer of knowledge, and design effective intervention strategies that are evidence-based;
- **Improving Cancer Information and Access:** the main objective of this area is to create accurate, integrated and accessible information to facilitate effective planning, implementation, monitoring and evaluation of cancer control efforts.

With funding from the federal government, through Health Canada, the Canadian Strategy for Cancer Control established the Canadian Partnership Against Cancer (CPAC) in 2007. With the mandate to continue working towards the overall priorities set by the CSCC, and an investment of \$260 million received over 5 years, CPAC is comprised of various action groups or “collaborative networks of experts that contribute cancer control knowledge and expertise” that help to coordinate national, provincial and territorial efforts in the areas of: primary prevention; screening; cancer guidelines; cancer journey; health human resources; research; and surveillance (Canadian Partnership Against Cancer (CPAC), 2009b). Overall, CPAC's role is to “act as a

catalyst for a coordinated approach that combines strengths of the Canadian cancer control community, maximizes efforts and resources, and achieves outcomes across the cancer control continuum.” (Canadian Partnership Against Cancer (CPAC), 2009b)

As articulated in their 2008-2012 Strategic Plan, CPAC’s goals are:

- To reduce the expected number of cancer cases;
- To enhance the quality of life for those affected by cancer;
- To lessen the likelihood of Canadians dying from cancer; and,
- To increase effectiveness and efficiency across the cancer control domain.

The Canadian Diabetes Strategy

Specific to diabetes, the Integrated Strategy invested \$115 million over five years (\$18 million per year of ongoing funding) to the Canadian Diabetes Strategy (CDS) (Public Health Agency of Canada, 2008b). Established in 1999 and renewed in 2005, the CDS currently maintains five major program areas, which are as follows (Public Health Agency of Canada, 2008b):

- **National Diabetes Surveillance System:** provides surveillance information concerning diabetes at provincial, territorial and national levels; also provides a foundation to support surveillance for other chronic diseases such as cardiovascular disease;
- **Knowledge Development and Exchange for Diabetes Prevention and Management:** includes research and evidence for understanding the causes of diabetes, as well as its prevention, effective management and cure; also includes strategies to translate science-based research into effective policies and programs, including tools for practitioners such as clinical practice guidelines related to diabetes;
- **Diabetes Community-Based Promotion and Programming:** organizes and implements programs that consider cultural and ethnic diversity, demographics and other existing high-risk conditions such as obesity and physical inactivity to meet the needs of high-risk populations and communities;
- **Diabetes Public Information:** seeks to further awareness of the importance of prevention and early detection of diabetes and increase the integration of messages with non-governmental organizations, public health units, and other health-delivery partners;
- **Diabetes Coordination:** supports and promotes national collaboration and coordination, both within the Federal government and with diabetes partners at the provincial and territorial levels, in order to maximize effectiveness.

Incorporated within each program area, the CDS also seeks to (Public Health Agency of Canada, 2008b):

- Support the development of healthy public policy;
- Provide community-based health promotion and prevention programs;
- Provide accessible health services for the prevention of diabetes in high-risk individuals and optimal diabetes detection and management;
- Develop human resource capacity and enhance the education of those who provide diabetes prevention and management programs and services; and,
- Conduct research and evaluation, and support knowledge exchange; and,
- Enhance diabetes surveillance.

The Alberta Diabetes Strategy

The 10-year Alberta Diabetes Strategy (ADS) was established in 2003 by Alberta Health and Wellness in response to and with support from the Canadian Diabetes Strategy. The ADS takes a population health approach to address type 2 diabetes across the lifecycle, and recognizes the influence of the determinants of health on diabetes risk²⁴.

With respect to the primary prevention of diabetes, the goal of the ADS is to reduce the incidence of type 2 diabetes in Albertans by 10% by 2013 (from 4.54 per 1000 population at risk in 2000 to 4.1 per 1,000 population at risk in 2013). Five of the nine strategic directions within the ADS will contribute to this goal, and include:

- Increasing programs and services aimed at strengthening healthy living practices.
- Enhancing public awareness and education about healthy living.
- Addressing the impact of low income and education on diabetes prevention.
- Strengthening professional knowledge, skills and practices in diabetes primary prevention.
- Addressing diabetes primary prevention needs of the Aboriginal population.

²⁴ The determinants of health include: income and social status, social support networks, education, employment and working conditions, social environments, physical environments, personal health practices and coping skills, healthy child development, biology and genetic endowment, health services, gender, and culture

Within the ADS, targets and indicators for measuring improvements within the above areas are provided. Examples of targets that are particularly relevant to this situational analysis include increases in:

- The proportion of Albertans who engage in healthy eating and regular physical activity;
- The proportion of Albertans reporting a healthy body weight;
- The availability of healthy eating and active living programs and services;
- Albertans' awareness and understanding of diabetes risk factors;
- Programs and policies directed towards individuals/groups with low income and low education levels;
- The proportion of health professionals involved in interdisciplinary promotion and education initiatives directed at diabetes prevention and using best practices for the primary prevention of diabetes; and,
- The number of intersectoral and integrated diabetes initiatives involving the Aboriginal population

Coordination between Alberta Health and Wellness, Alberta Health Services, individuals and families, communities (including the education system and employers), health professionals, not-for-profit and other community organizations, the corporate sector, the media, and all levels of government (municipal, provincial, and federal) is necessary to achieve these targets according to the ADS. The ADS aims to prevent type 2 diabetes by addressing risk factors that are common to multiple chronic diseases, and consequently represents a strategy that can contribute to reduced rates of diabetes, certain cancers and cardiovascular disease.

The Canadian Heart Health Strategy

The Canadian Heart Health Strategy and Action Plan (CHHS-AP) was released in February 2009, as part of the 2005 Integrated Strategy's investment of \$18.9 million over five years, as a pan-Canadian strategy to reduce the incidence of and mortality from heart disease, stroke, and other vascular diseases.

According to the CHHS-AP, issues within the healthcare system are compounding the burden of these diseases: the cardiac care system is difficult for patients to navigate appropriately; wait times are often too long; follow-up procedures are inadequate to prevent hospital readmissions; and quality of cardiac care varies considerably across Canada and practice is not always evidence-based.

To reduce the burden of cardiovascular disease in Canada, the CHHS-AP has set ambitious targets for 2020, which include reducing mortality from CV diseases,

reducing the prevalence of CV disease in Aboriginal/Indigenous peoples, and increasing the number of Canadians aged 45+ who have had cardiovascular disease risk assessments, amongst others. In addition, they plan to form partnerships to reduce the rate of smoking, increase consumption of fruits and vegetables, increase physical activity, and decrease obesity.

To achieve its targets, the CHHS-AP has outlined 6 recommendations (Canadian Heart Health Strategy and Action Plan (CHHS-AP) Steering Committee, 2009):

- **Create Heart Healthy Environments:** by improving socio-economic determinants of health, improving the nutritional quality of the food supply and access to healthy foods, creating more opportunities for physical activity, and reducing tobacco use and exposure, Canada can address some of the root causes of CV disease.
- **Help Canadians Lead Healthier Lives:** through the formation of partnerships between disease organizations for public education and health literacy, developing and maintaining interactive information on CV health and diseases, delivering CV risk screening, education, and follow-up in the community, Canadians can become active participants in their own health and learn to make heart healthy choices.
- **End the CV Health Crisis among Aboriginal/Indigenous Peoples:** by developing a long-term action plan to meet the specific needs of Aboriginal communities and partnering with Aboriginal organizations and communities, all levels of government and NGOs, a national centre for chronic disease prevention in Aboriginal communities should be created. The centre would work to create Heart Healthy Aboriginal communities, build a knowledge base to enhance prevention efforts, and build capacity to provide more Aboriginal and other culturally-sensitive health service providers.
- **Continue the Reform of Health Services – Provide Integrated, Patient-Centered, Cardiovascular Care:** effective cardiovascular care should involve: the formation and training of interprofessional primary care teams and the dissemination of best practices; improved access to specialized cardiovascular care; and the maintenance of evidence-based clinical practice guidelines.
- **Build the Knowledge Infrastructure to Enhance Prevention and Care:** collecting Canadian data on CV disease prevalence, incidence, risk factors, and health inequities and moving forward with electronic health records will help to improve our knowledge and inform and enhance CV prevention and care strategies.

- **Develop the Right Service Providers with the Right Education and Skills:** build capacity in CV prevention and care through training in chronic disease management and interprofessional practice to continue to improve the skills of CV care providers.

Implementing these six recommendations will allow the 2020 targets for cardiovascular disease to be met by promoting a co-ordinated, pan-Canadian approach to chronic disease management (Canadian Heart Health Strategy and Action Plan (CHHS-AP) Steering Committee, 2009). The CHHS-AP addresses upstream determinants of health to reduce risk, promotes the formation of partnerships for knowledge exchange and rapid translation of knowledge to practice, and the establishment of a high-quality, culturally-competent, evidence-informed care network to provide efficient and effective chronic disease management (Canadian Heart Health Strategy and Action Plan (CHHS-AP) Steering Committee, 2009). The recommendations presented here can provide a strong foundation for the future health of Canadians and ensure that cardiovascular disease incidence and mortality is greatly reduced.

Currently the Heart and Stroke Foundation of Canada is advocating for the implementation of various targeted initiatives from the CHHS-AP in the federal government's budget of 2010.

Canadian Stroke Strategy

The Canadian Stroke Strategy is a joint initiative of the Canadian Stroke Network and the Heart and Stroke Foundation of Canada. Established in 2006, the CSS takes an integrated and inter-disciplinary approach to addressing the full continuum of stroke care (prevention, treatment, rehabilitation, and community reintegration) through the implementation of evidence-based best practice (Canadian Stroke Strategy, 2009). It is the goal of the CSS to support stroke prevention, treatment and rehabilitation in every province and territory by 2010, through training and education programs, best practices, awareness initiatives and evaluation and monitoring systems (Canadian Stroke Strategy, 2009). The Canadian Best Practice Recommendations for Stroke Care 2008 update is an essential component of the support that the CSS provides to its national and provincial partners (Lindsay et al., 2008). Derived from an extensive review of international stroke research and evidence-based recommendations and guidelines related to stroke, the CCS' Recommendations are concerned with improving public awareness, patient and family education, and the prevention of stroke through lifestyle and risk factor management (Lindsay et al., 2008).

Highlights of the Recommendations that are most relevant to designing, implementing and evaluating health promotion initiatives in Alberta directed at stroke prevention and management include (Lindsay et al., 2008):

- All members of the public should be able to recognize and identify the signs and symptoms of stroke, which include sudden weakness, trouble speaking, vision problems, headache and dizziness;
- Public education on stroke should:
 - Emphasize that stroke is a medical emergency and that immediate medical attention should be sought; and,
 - Include information that stroke can affect persons of any age – from children to adults.
- Education that is integrated and coordinated should be provided in a timely manner across the continuum of stroke care for all patients with stroke or at risk for stroke, as well as their families and caregivers.
- Persons at risk of stroke and patients who have had a stroke should be assessed for vascular disease risk factors and lifestyle management issues (diet, sodium intake, exercise, weight, smoking and alcohol intake) and should receive information and counseling about possible strategies to modify their lifestyle and risk factors, if applicable; and,
- Individuals with hypertension (high blood pressure), high lipid levels (cholesterol) and type 2 diabetes should be monitored for their risk of stroke.

Alberta Provincial Stroke Strategy

Similar to the Canadian Stroke Strategy, the Alberta Provincial Stroke Strategy (APSS) is a province-wide initiative that is focused on inter-regional collaboration for the delivery of stroke care, the promotion of population health, the development of healthy communities, and the management of chronic diseases (Alberta Provincial Stroke Strategy, 2006). The principal goals of the APSS are (Alberta Provincial Stroke Strategy, 2006):

1. To reduce stroke incidence in Alberta;
2. To improve stroke care at all levels throughout Alberta by implementing National standards of care;
3. To optimize recovery and quality of life for stroke survivors in all health regions;
4. To reduce the financial burden of stroke in Alberta.

To reach these goals, the APSS is focused on all levels of the continuum of stroke care and uses its resources to implement stroke and vascular disease health promotion and prevention strategies (Alberta Provincial Stroke Strategy,

2005). Public education is a significant component of the APSS to ensure that initiatives for early detection and management of major stroke risk factors (i.e., hypertension, cholesterol, diabetes) are effective and evidence-based. Overall, the APSS posits that “aggressive and more pervasive management of stroke risk factors offers tremendous potential for reduction of stroke incidence and the incidence of all the major forms of vascular disease” (Alberta Provincial Stroke Strategy, 2006).

The APSS uses its own set of recommendations and implementation tools (protocols, order sets, planning tools, etc) to support the implementation of stroke systems of care across the province. The following are those recommendations which pertain to the APSS’ Health Promotion and Disease Prevention pillar:

- Develop and implement population health programs to decrease the development of risk factors for stroke and other cardiovascular diseases (e.g., smoking, weight, diet).
- Develop and implement primary prevention programs focused on established disease risk factors for stroke and other cardiovascular diseases (e.g., hypertension, cholesterol, diabetes)
- Implement an organized provincial awareness campaign that addresses the signs and symptoms of stroke.
- Develop a stroke prevention service for high risk individuals (i.e., transient ischemic attack sufferers, previous stroke patients).

Initiatives designed, implemented and evaluated to improve the nutrition, physical activity and weight management health behaviours of Albertans will likely have a positive impact on the risk of stroke at the population level by first impacting those factors, including hypertension, cholesterol intake and diabetes that mediate stroke risk.

Alberta Strategies for Nutrition, Physical Activity and Weight Management

At the time of this publication, there were no published Alberta-specific nutrition and/or weight management strategies. However, a provincial strategy for the prevention of unhealthy body weights is currently in development within Alberta Health Services, Health Promotion, Disease and Injury Prevention. The proposed Alberta Strategy for the Prevention of Unhealthy Body Weights was developed in consultation with stakeholder groups of Alberta’s leading obesity researchers, health-practitioners, and policy makers and is expected to be released in winter 2010.

The three broad areas identified for potential investment within this strategy include:

- Healthy head starts: Promoting healthy weights from pre-conception to preschool
- Healthy 9-5: Facilitating healthy choices in the settings where Albertans spend their days (schools, workplaces)
- Partnerships and policies for a healthier Alberta: Positioning AHS as a 'health voice' at a range of intersectoral tables where there is public health relevance.

While this strategy is currently in the proposal stage, if approved it will provide a starting point for developing comprehensive solutions to reduce the prevalence of unhealthy body weights (and associated behaviours related to nutrition and physical activity) within the province.

Alberta Active Living Strategy

While there are currently no provincial weight management or nutrition strategies, the Alberta Active Living Strategy (1997) was intended to address physical activity within the province. Prompted by increasing rates of physical inactivity, the Alberta Ministry of Community Development established the Active Living Task Force to create the Alberta Active Living Strategy (AALS). Using input collected from focus groups with Albertans from all walks of life, the AALS consisted of 23 recommendations intended to promote active living in communities, schools and workplaces across the province (Alberta Sport, Recreation, Parks and Wildlife Foundation, 2009).

The recommendations made within the Alberta Active Living Strategy have strategic policy, partnership and program implications, and almost all are relevant to disease prevention efforts related to the uptake and retention of a physically active lifestyle. Examples of applicable recommendations for chronic disease prevention through physical activity include (Alberta Sport, Recreation, Parks and Wildlife Foundation, 2009):

- Each Regional Health Authority should become a model for programs on active living and healthy eating and active living and nutrition staff and services should be included as part of the Authorities' health promotion programs (#3);
- All Alberta schools should be required to create a school environment that provides encouragement and opportunities for students to be physically active during each school day (#14);

- Operators of housing and care institutions for older adults should be required to provide facilities and resources to provide their residents with opportunities to engage in regular physical activity (#18);
- An incentive structure should be established for employers to provide active living programs to their employees (#21).

A more detailed summary of the AALS recommendations is publicly available from the Alberta Sport, Recreation Parks and Wildlife Foundation (Alberta Sport, Recreation, Parks and Wildlife Foundation, 2009).

Summary of Strategies for Healthy Living and the Prevention of Chronic Disease

Internationally and nationally-recognized population health strategies were reviewed above. Noting that they were developed by different organizations and encompass many disease-specific ‘best practices,’ they do have several common features that can be used to address different chronic diseases.

Throughout the review, recurring emphasis was placed on:

- Developing and adopting healthy public policies (see below);
- Addressing the broader determinants of health that influence individuals’ behaviours, such as income, education, and housing;
- Offering public education and awareness initiatives to increase the public’s health literacy and knowledge of the relationships between modifiable behaviours and health and disease;
- Increasing the number of evidence-based population health programs that target established risk factors for chronic disease and are responsive to individual and community needs;
- Developing a workforce of health service providers who are appropriately trained and equipped with the knowledge, and provided with the continuing education necessary to deliver high quality preventive care and treatment for chronic diseases;
- Prioritizing preventive initiatives for populations who have disproportionately higher exposures to lifestyle risk factors or higher rates of chronic disease, such as Alberta’s Aboriginal population;
- Supporting early detection and management (secondary and tertiary prevention) of chronic diseases to greatly reduce associated morbidity and mortality;
- Establishing multi-sectoral partnerships and networks to create and implement effective chronic disease prevention initiatives; and,
- Building the social and physical infrastructure to support disease surveillance, research, evaluation, and knowledge exchange related to the prevention of chronic diseases.

Prioritization of these common features is essential to developing an effective population health strategy to meet the nutrition, physical activity and weight management-related goals of Alberta Health Services’ Population Health portfolios. Such a strategy must use an overarching systems approach, similar to that of the Integrated Strategy, where the interrelationships between different chronic diseases and their common risk factors are addressed to the

fullest extent to have their greatest impact on overall incidence, morbidity and mortality. While at the same time, unique features and requirements of specific diseases, risk factors and at-risk populations must also be integrated into prevention services.

Policies Related to Nutrition, Physical Activity and Weight Management

WCRF / AICR Policy and Action for Cancer Prevention

In 2009, the World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR) partnered to publish “Policy and Action for Cancer Prevention: Food, Nutrition, and Physical Activity: a Global Perspective” which outlined 48 major policy initiatives to prevent cancer globally. This new Policy Report builds on the conclusions of the 2007 WCRF/AICR Report, *Food, Nutrition, Physical Activity and the Prevention of Cancer: A Global Perspective* (referenced in Chapter 2) which examined the effect of behavioral and environmental factors such as food, nutrition, physical activity and body composition on cancer risk (World Cancer Research Fund & American Institute for Cancer Research, 2009). The accompanying Policy Report outlines specific policy objectives focused on the environmental, economic and social factors that influence nutrition, physical activity and weight management cancer and chronic disease risk factors (World Cancer Research Fund & American Institute for Cancer Research, 2009).

The Policy Report emphasizes that an effective disease prevention, treatment and control strategy should (World Cancer Research Fund & American Institute for Cancer Research, 2009):

- Incorporate the existing body of evidence that demonstrates the influences of nutrition, physical activity and body composition on disease risk;
- Coordinate program and policy efforts with multiple stakeholders and policy actors;
- Promote and create changes, beyond the political realm, in agriculture, trade policies, civil engineering, transportations systems, workplaces, buildings and offices, families and individuals.

Supported by the United Nations and other international agencies, the Policy Report also makes 48 recommendations to achieve several public health goals. These recommendations are multi-dimensional and outline responsibilities and aims that are sub-divided across the following nine actors or stakeholder groups (World Cancer Research Fund & American Institute for Cancer Research, 2009):

- **Multinational bodies:** Originate and promote coordinated strategies that protect public health through food, nutrition, and physical activity.
- **Civil society:** Create, advocate, and develop sustainable policies and actions that ensure healthy food, nutrition, and physical activity for all.
- **Government:** Use legislation, pricing, and other policies at all levels of government to promote healthy patterns of diet and physical activity.
- **Industry:** Emphasize the priority given to public health including cancer prevention in strategic planning and action.
- **Media:** Sustain increased coverage of public health and well-being and prevention of obesity and chronic diseases including cancer.
- **Schools:** Make food systems, food, nutrition, and regular physical activity essential parts of school life and learning.
- **Workplaces and Institutions:** Institute and implement policies that promote physical activity and healthy meals and body weight.
- **Health and other professionals:** Conduct professional practice to realise the potential for promoting health including cancer prevention.
- **People:** Act as members of households and communities and as citizens, not just as customers and consumers, in achieving health ways of life.

The Policy Report acknowledges that healthy public policy to prevent chronic disease is a shared responsibility by all nine actors. Accordingly, cooperation and coherency between actors and government, at all levels, is vital to develop policies and turn them into effective actions.

Table 6.1 shows the actors immediately needed to work in partnership with governments in the achievement of the Policy Report’s recommendations. The left hand column of the table lists the recommendations for each actor. Absence of a tick does not necessarily imply that an actor is irrelevant. The actors ticked are those judged to be most important.

Table 6.1 - Government: Working with other actors (World Cancer Research Fund & American Institute for Cancer Research, 2009)

	Multinational bodies	Civil society organizations	Government	Industry	Media	Schools	Workplaces institutions	Health Professional	People
Examine, audit, and revise legislation and regulations so that they protect public health and prevent disease	✓		✓						
Ensure that built and external environments are designed and maintained in ways that facilitate physical activity and health behaviour	✓	✓	✓	✓		✓	✓	✓	
Encourage safe, nutrient-dense, and relatively unprocessed foods and drinks and discourage sugary and alcoholic drinks, 'fast food', and other processed food	✓	✓	✓	✓	✓	✓	✓	✓	✓
Require schools to provide meals to high nutritional standards and facilities for recreation and sport, and to include nutrition and physical activity in core curricula	✓	✓	✓	✓		✓		✓	✓
Require all government and publicly funded facilities that provide catering to ensure that their meals, foods and drinks are of high nutritional quality	✓	✓	✓	✓			✓	✓	✓
Require widespread dedicated walking and cycling facilities throughout built and external environments	✓	✓	✓	✓		✓	✓		
Restrict advertising and marketing of 'fast food' and other processed foods and sugary drinks to children, on television, in other media, and in supermarkets	✓	✓	✓	✓	✓	✓		✓	✓
Incorporate UN recommendations on breastfeeding into law or appropriate public health and consumer protection rules	✓	✓	✓	✓	✓		✓	✓	✓
Give greater priority to research on, and programmes to improve, public health including the prevention of cancer and other diseases	✓	✓	✓	✓				✓	
Establish and maintain publicly funded information and education on, and surveillance of, food, nutrition, and physical activity status	✓	✓	✓		✓			✓	
Ensure that international food trade and aid sustains future health as well as providing immediate relief for populations in recipient countries	✓	✓	✓	✓	✓			✓	

The recommendations of the Policy Report must be prioritized through engagement of all actors in order to develop and implement effective health policies within an Alberta context. It is the recommendation of Alberta Health Services' Population Health Innovation and Decision Support (PHIDS) that regular stakeholder meetings be organized to guide future policy initiatives.

CPAC – Environmental Scan of Cancer Prevention Policy and Legislation

In 2009, the Canadian Partnership Against Cancer (CPAC) released a federal, provincial, municipal policy scan report, concurrently with the WCRF/AICR global Policy Report to create a baseline policy and legislation inventory for Canada and its provinces to guide future research, and track ongoing development of policy initiatives. Conducted in collaboration with the Alder Group, the scan, entitled “Environmental Scan of Cancer Prevention Policy and Legislation as it relates to Food, Physical Activity, Alcohol and Public Education in Canada” examined multiple databases and conducted key informant interviews to identify policies and programs that address chronic disease risk factors related to nutrition and physical activity within a ten-year period (1997-2007) (Canadian Partnership Against Cancer (CPAC), 2008). This information is up to date as of 2007.

Federal and Provincial Nutrition Policies

Healthy nutrition policy falls within the mandate of federal, provincial and municipal governments and educational institutions. The federal government is responsible for the establishment of national dietary guidance and informational policy, and has authority over the use of the Goods and Services Tax (GST), food labelling, managing the Canadian Food Inspection Agency, and Food and Drug Act. Policies and legislation over food advertising and food safety fall under both federal and provincial authority.

In 2002, the Alberta Ministry of Health & Wellness released its Framework for a Healthy Alberta which set out targets and objectives for the adoption of healthy behaviours and the reduction of chronic diseases by the year 2012. This was followed in 2007 with the development of Healthy Kids Alberta, a joint Alberta Health and Wellness and Alberta Education initiative (Canadian Partnership Against Cancer (CPAC), 2008). As a 10-year cross-ministerial child and youth wellness strategy, Healthy Kids Alberta supports the development and implementation of health promotion initiatives (Canadian Partnership Against Cancer (CPAC), 2008).

All Canadian provinces and territories have set nutrition standards for food and beverages in educational settings. The Alberta government released Alberta Nutrition Guidelines for Children and Youth in 2008. The settings include childcare, school and recreation/community centres, thus there is a potential to impact the food choices available to families in addition to children and youth. However, Alberta presently has many gaps in policies and legislation in other areas and settings that concern nutrition. Ontario is a national leader with many

healthy eating regulations currently considered, including guidelines for vending machines, food safety legislation, and a provincial trans-fat law (Canadian Partnership Against Cancer (CPAC), 2008). In the area of food safety legislation, Alberta is also limited when compared to British Columbia, Yukon, New Brunswick and Ontario, who have all implemented provincial regulations (Canadian Partnership Against Cancer (CPAC), 2008).

Table 6.2 presents the federal, provincial and territorial legislation and policies on nutrition that were implemented, proclaimed or considered between 1997 and 2007 (Canadian Partnership Against Cancer (CPAC), 2008). In the table, the code of “NC” represents an area where no policies or legislation is considered, whereas “n/a” represents an area where regulatory authority is not applicable; both of these codes are indicative of the state of nutrition policy and legislation in Alberta. Moreover, the code of “C” represents an area where a nutrition policy or legislation is considered, “NP” where a policy or legislation is yet to be proclaimed, and “X” is where a strategy has been adopted and/or implemented. It is hoped that this table can be regularly updated as part of the monitoring of current Alberta policies.

Table 6.2: Federal, Provincial and Territorial Legislation and Policies on Nutrition (1997-2007) (Canadian Partnership Against Cancer (CPAC), 2008)

Nutrition Policy Options	FED	NS	NB	PEI	NL	QC	ON	MB	SK	AB	BC	YT	NWT	NT
Tax credits and incentives (PST/GST exemptions)	NP	NC												
Food and Drug Act amendments	NP	n/a												
Food labelling legislation	X	n/a												
Legislation creating <i>Canadian Food Inspection Agency</i>	X	n/a												
Restrictions on advertising food products to children ²⁵	NC	NC	NC	NC	NC	X	C	NC						
P/T food safety legislation amendments	n/a	NC	X	NC	NC	NC	X	NC	NC	NC	X	X	NC	NC
P/T healthy eating strategies (excl. healthy living strategies)	n/a	X	NC											

Legend:
 X = legislation/policy implemented or strategy adopted
 NP = legislation not proclaimed (in progress)
 C = legislation/policy considered (e.g. private member’s bill)
 n/a = not available/applicable (among other things, this accounts for F/P/T variance in regulatory authority)
 NC = no legislation/policy considered

²⁵ While the focus of this Situational Analysis is the reduction of chronic disease risk among adults, we have chosen to include this policy option from the *Environmental Scan of Cancer Prevention Policy and Legislation as it relates to Food, Physical Activity, Alcohol and Public Education* conducted by the Canadian Partnership Against Cancer, in accordance with their request.

Federal and Provincial Physical Activity Policies

While there is a lack of federal policies related to physical activity, a number of provinces and territories have initiated province-wide physical activity programs and policies over the past decade in response to growing concern about an increasingly sedentary population. New Brunswick, Nunavut, and Northwest Territories are presently the only provinces/territories who do not have a population-level provincial physical activity strategy. Ontario and Nova Scotia are the trailblazers, with tax credits and incentives for physical activity and as well as physical activity guidelines. Alberta has made some progress in this area with the development of the Alberta Active Living Strategy (see below) and the passing of Bill 206, The Alberta Personal Income Tax (Physical Activity Credit) Amendment Act, 2008, but formal legislation for the latter is yet to be implemented. Table 5-3 presents the federal, provincial and territorial legislation and policies on physical activity that were implemented, proclaimed or considered between 1997 and 2007

Table 6.3: Federal, Provincial and Territorial Legislation and Policies on Physical Activity (1997-2007) (Canadian Partnership Against Cancer (CPAC), 2008)

Physical Activity Policy Options	FED	NS	NB	PEI	NL	QC	ON	MB	SK	AB	BC	YT	NWT	NT
Tax credits and incentives	X	X	NC	X	NC	NC	X	NC	X	X	NC	NC	NC	NC
P/T physical activity strategies (excl. healthy living strategies)	n/a	X	NC	X	X	X	X	X	X	NC	X	X	NC	NC
Designated P/T funding streams to support physical activity (excl. healthy living strategies)	n/a	NC	X	NC	NC	X	NC	NC						
P/T transportation policies with physical activity promotion components	n/a	X	NC	NC	NC	NC	NC	NC	NC	NC	X	NC	NC	NC

- Legend:**
- X = legislation/policy implemented or strategy adopted
 - NP = legislation not proclaimed (in progress)
 - C = legislation/policy considered (e.g. private member's bill)
 - n/a = not available/applicable (among other things, this accounts for F/P/T variance in regulatory authority)
 - NC = no legislation/policy considered

Municipal Policies in Alberta

Nutrition Policies

In terms of policy work to create supportive environments and strengthen community action for nutrition and healthy eating, Edmonton and Calgary are also the provincial municipal forerunners but with a twist. For example, in the 2006 City of Edmonton's Environmental Strategic Plan (ESP), food insecurity, similar to air pollution, is regarded as a threat to the city's environmental sustainability, while community garden programs are seen as potential solutions. The ESP recommends that actions, programs and targets focused on the city's environmental sustainability include, among others, various initiatives and programs to promote walking and cycling as alternative modes of transportation (City of Edmonton, 2006).

The City of Calgary takes a different approach to nutrition policy through its Imagine Calgary Plan (2007), which aims to support the development of food sources derived from sustainable practices that provide a high quality, healthy, affordable and secure supply of food. Similar to Edmonton's ESP, the Imagine plan also aims to support transportation systems that serve the access and mobility needs of all people through a choice of convenient, comfortable, affordable and efficient transportation modes.

Physical Activity Policies

A number of Canadian municipalities have adopted active transportation policies to address the physical activity levels of their residents. While these policies vary in scope, they share a common aim of making it easier for individuals to use non-motorized and public transportation options involving greater levels of physical activity through walking, bicycling, in-line skating and the use of public transit. (Canadian Partnership Against Cancer (CPAC), 2008). In Alberta, municipal policy initiatives for physical activity and active transportation have lacked provincial collaboration and cohesiveness. The municipal governments of Calgary and Edmonton, respectively, have made the most progress in this area, while smaller cities and towns have yet to gain momentum.

Since 1997, the city of Edmonton has two enacted two municipal policy plans relevant to physical activity. The first is the Bicycle Transportation Plan (2008), which aims to promote bicycling as an alternate form of transportation and recreational activity and support the development of relevant infrastructures (City of Edmonton, 2009). The second is the Urban Parks Management Plan (2006), which guides the future acquisition, design, construction and

maintenance of City parks, river valley and natural areas in order to create spaces for play, sport, exercise, relaxation, social interaction and education (City of Edmonton, 2008).

By comparison, the city of Calgary has enacted nine policies and/or plans to create supportive environments for physical activity. For example, the city has a bylaw (20M2003, 2008) to regulate the use of parks and pathways to promote sports and recreational activities (City of Calgary, 2008a). It is a complement to the city's Civic Sport Policy (2005), which aims to provide dynamic sport environments to enable Calgarians to be involved in sport to the extent of their individual abilities and interests (City of Calgary, 2005). Moreover, in 2008 the city of Calgary enacted two separate policies to complement its 1995 Calgary Transportation Plan and re-affirm the importance of walking and bicycling as meaningful, non-motorized choices of transportation (City of Calgary, 2008b). Both policies are designed to establish broad, city-wide policies that provide direction and guidance on how to plan, design, build, operate and maintain a city where walking and cycling are meaningful forms of transportation for social and economic activities (City of Calgary, 2008b).

Provincial School-Based Nutrition and Physical Activity Policies

While this Situational Analysis has focused on nutrition, physical activity and weight management evidence, programs and conclusions for adults, 18 years of age or older, it is worthwhile to review the relevant policy work that has been recently conducted for Alberta's children and youth. As the province's youth obesity rates continue to increase, nutrition and physical activity have moved into the realm of schools, and the policy spotlight (Canadian Partnership Against Cancer (CPAC), 2008). Both the province of Alberta and its municipalities have jurisdiction over educational institutions. The WCRF Policy Report recommends that vending machines offering foods that are high in sugar, salt and fat be withdrawn from schools. Ontario and British Columbia have policies in place to curb the use of vending machines. Presently, Alberta is not considering any legislation, but does have guidelines regarding the provision of food in schools. The WCRF report also calls for the provision of daily meals for staff and pupils, which no Canadian province has yet to attain.

Commencing in September 2005, Alberta Education introduced a province-wide Daily Physical Activity (DPA) policy requiring all grade 1-9 students in Alberta schools to be physically active for at least 30 minutes a day (Canadian Partnership Against Cancer (CPAC), 2008). Quebec and British Columbia have both adopted policies requiring mandatory daily physical activity for students from kindergarten through high school.

Table 6.4 presents the federal, provincial and territorial legislation and policy options for nutrition and physical activity that were implemented, proclaimed or considered between 1997 and 2007.

Table 6.4: School-based Legislation and Policy Options for Nutrition and Physical Activity (Canadian Partnership Against Cancer (CPAC), 2008)

Nutrition and Physical Activity Policy Options	FED	NS	NB	PEI	NL	QC	ON	MB	SK	AB	BC	YT	NWT	NT
Mandatory physical education or daily physical activity requirements (K-12)	n/a	NC	NC	NC	NC	X	NC	NC	NC	NC	X	NC	NC	NC
Mandatory physical education or daily physical activity requirements (K-9)	n/a	X	C	NC	NC	NC	X	NC	NC	X	NC	NC	NC	NC
Updates to physical education curriculum guidelines	n/a	NC	X	NC	X	NC	X	X	NC	NC	NC	NC	NC	NC
Trans fat regulations on food products in schools	n/a	NC	NC	NC	NC	NC	X	X	NC	NC	C	NC	NC	NC
Guidelines/nutritional standards re. provision of food/beverages in schools	n/a	X	X	X	X	X	X	X	X	X	X	X	X	X
Policy re. provision of school feeding programs (universal accessibility requirement)	n/a	NP	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Guidelines for vending machine content in schools and public buildings	NC	NC	NC	NC	NC	NC	X	NC	NC	NC	X	NC	NC	NC

- Legend:**
- X = legislation/policy implemented or strategy adopted
 - NP = legislation not proclaimed (in progress)
 - C = legislation/policy considered (e.g. private member’s bill)
 - n/a = not available/applicable (among other things, this accounts for F/P/T variance in regulatory authority)
 - NC = no legislation/policy considered

Summary & Conclusions

Similar to behaviour-change, policy change is a long process and must be prioritized, effective, evidence-based, and guided by all stakeholders. Public policy is one of the strongest mechanisms to promote long-term change at the population level. While Alberta has many nutrition and physical activity policies for children, an effective policy framework must be developed that coincides with current programmatic, institutional and individual efforts to address the nutrition, physical activity and weight management outcomes of the province's adult population.

In 2009, the Canadian Partnership Against Cancer's Environmental Scan of Cancer Prevention Policy and Legislation as it relates to Food, Physical Activity, Alcohol and Public Education noted 7 barriers to policy change in Canada:

- Lack of evidence, including limited baseline data and lack of monitoring/reporting mechanisms for promising initiatives;
- Structural and jurisdictional barriers, including federal/provincial issues;
- The current financial climate, which could lead to a scaling back of public health investments;
- Lack of political leadership and ideological differences;
- Inability of decision makers to think long-term (i.e., beyond election 'windows');
- The power of vested interests (e.g., the food industry); and,
- Lack of public support (Canadian Partnership Against Cancer (CPAC), 2008).

To overcome these barriers, the recommendations from the strategy frameworks reviewed above lay the groundwork for advancing healthy public policies and programs for chronic disease prevention in Alberta. Putting all of the different strategic frameworks into a provincial context, a more comprehensive understanding of how the health of Albertans is affected by social, economic, cultural, political and environmental circumstances is still required.

Further investigation and analysis is necessary to build upon and strengthen existing evidence for potential interventions, programs and policies, aimed at the integrated prevention and management of chronic diseases and their risk factors, to be designed, delivered and evaluated. There is also a need to identify and address major gaps in existing frameworks, regardless of whether they are disease or behaviour-specific, to improve on the past and either make adaptations or create new frameworks to prevent chronic disease and promote nutrition, physical activity and weight management health behaviours that are:

- **Comprehensive**, requiring a combination of interventions, programmatic and policy work to address the health behaviours of population and individuals;
- **Flexible**, and responsive to balance the needs of diverse and high-risk groups;
- **Evidence-based**, applying the best available evidence gained from scientific research to strategic planning and healthcare decision making;
- **Integrated** across disease prevention and risk-factor control strategies;
- **Intersectoral**, because most of the major social, economic and environmental determinants of the chronic-disease burden lie outside the health sector; and,
- **Communicative**, utilizing knowledge management and exchange strategies to communicate the importance of disease prevention and healthy living.

Moving forward, it is recommended that Alberta Health Services' Population Health portfolios use this Situational Analysis, thoroughly considering the above criteria and content from this and previous chapters, to pursue action and develop its own population health strategy to quickly and comprehensively prevent disease and address the health behaviours of Albertans.

Chapter 7: Recommendations & Best Practices

Key Findings

- At an individual-level, eating a healthy diet (described below), participating in regular moderate to vigorous-level physical activity, and maintaining a healthy body weight contributes to reduced risks cancer, type 2 diabetes, and cardiovascular disease.
- Interventions, programs and policies related to these modifiable behavioural factors should be grounded in theories of behaviour change, tailored to individual/group needs, delivered in optimal settings, developed using participatory methods and an appropriate mix of strategies, designed to foster social support, of sufficient intensity and duration, and well-evaluated.
- Based on the evidence presented in this situational analysis, recommendations for action within AHS and Alberta include the following :
 - Create new baseline measures and indicators to coincide with the surveillance and monitoring of existing targets for chronic disease prevention
 - Establish a central body to collect and manage health data within the province
 - Conduct further applied research to examine key target (priority) populations, including rural Albertans, Aboriginal groups and young adults
 - Complete a comprehensive review of policy alternatives with potential to improve dietary habits, activity levels and the prevalence of overweight and obesity
 - Establish a cross-sectoral organization capable of working collaboratively and dedicating sustained time and resources to reduce chronic disease through primary prevention
 - Create a comprehensive, long-term strategy for obesity prevention and reduction in the province of Alberta
 - Develop, implement, and evaluate an evidence-based provincial workplace program intended to improve the nutrition, physical activity, and weight-related behaviours of Albertan adults.

Introduction

In 2005, 8,571 of the 19,288 deaths (44% of total mortality) that occurred in Alberta were attributed to diabetes mellitus, major cardiovascular diseases (including cerebrovascular disease), or cancers that are convincingly associated with poor nutrition, physical inactivity and overweight and obesity (Statistics Canada, 2009). This estimate does not include deaths from diseases that have probable associations with these modifiable risk factors. As the population grows older, the burden of these ailments for the population and the healthcare system is projected to increase dramatically:

- Between 2004 and 2033, nearly six million new cancer cases (5,911,823) are expected to occur across Canada if current behaviours related to tobacco use, nutrition, and physical activity remain the same (Smetanin & Kobak, 2005).
- The prevalence of type 2 diabetes in Canada is expected to increase from 1.4 million in 2000 to approximately 2.0 million in 2016, which includes an 85.8% increase in diabetes prevalence among Albertans (Ohinmaa et al., 2004).
- The number of Albertans over the age of 40 years with ischemic heart disease (IHD) will increase by 135% from 154,072 in 2008 to an estimated prevalence of 362,118 cases by 2035 (Alberta Health and Wellness – Surveillance and Environmental Health Branch, 2008).

Without effective preventive interventions, the burden of cancer, type 2 diabetes, and cardiovascular disease will continue to rise in Alberta. A comprehensive chronic disease prevention strategy that supports nutritious dietary habits, active living, and healthy weights, is required to ensure that the population remains healthy throughout the life course, especially midlife and later adulthood.

An integral part of a chronic disease prevention strategy is translating the scientific evidence into recommendations for individuals, interventions and programs, and advocacy, policy and legislation at multiple levels. Recommendations and best practices must be grounded in the best available evidence and also consider the current context in Alberta and Canada when setting goals and objectives for individuals and the Alberta population as a whole. Any collection of evidence-based recommendations and best practices for nutrition, physical activity and weight management should also be comprehensive enough to address macro-level and environmental determinants (e.g., healthy public policy, the creation of supportive built and/or social environments), in addition to the actualized needs of multiple at-risk groups, based on demographic and behavioural determinants (e.g., sex, age, etc.), and

unique populations (e.g., Aboriginal communities) that reside within different geographic and contextual circumstances.

Recommendations & Best Practices

Evidence-based individual-level recommendations and population level-goals for Alberta can be made to address risk factors related to nutrition, physical activity and weight management. The evidence linking poor nutrition, physical inactivity and obesity to cancer, type 2 diabetes and cardiovascular diseases (reviewed earlier in Chapter 3) originated from high-quality systematic reviews, meta-analyses, prospective cohort studies, and expert agreements on recommendations for chronic disease prevention. This evidence base can be used as a starting point to formulate recommendations and best practices that are relevant to Alberta and can be effectively applied across the province. Related content from Health Canada, the Canadian Cancer Society, the American Cancer Society, the Canadian Diabetes Association, the American Diabetes Association, the Heart and Stroke Foundation of Canada, the American Heart Association, the World Health Organization, and other agencies concerned with chronic disease prevention in Canada and other countries was also reviewed for this purpose. (Adams et al., 2008; American Cancer Society, 2006; American Diabetes et al., 2008; American Dietetic Association, 2005; American Dietetic Association, 2006; Canadian Cancer Society, 2009; Canadian Diabetes Association, 2008; Canadian Stroke Network(CSN) & Heart and Stroke Foundation of Canada (HSFC), 2006; Eyre et al., 2004; Health Canada, 2007; Heart and Stroke Foundation of Canada, 2009b; S. Klein et al., 2004a; D. C. W. Lau et al., 2007; Sheard et al., 2004; World Health Organization (WHO), 2004)

While the following recommendations are intended for individuals and populations around the world, a consideration of local characteristics is important in creating recommendations that are relevant to and effective within the Alberta context. As such, recommendations from reputable Canadian and Albertan organizations regarding nutrition, physical activity and body weight, as well as the provincial and regional profiles (described in Chapter 4) are considered in conjunction with the recommendations from the evidence sources described above.

The recommendations and best practices that are outlined here are broad in scope, and provide a starting point for developing programs and policies related to nutrition, physical activity, and weight management. The authors recognize that a higher level of detail and more research will be necessary to inform the development of specific programs and policies; however, a more detailed review of best practices for specific populations (including high risk or vulnerable populations), types of programs, policies, and interventions, and settings was beyond the scope of this analysis. Rather, the high level best

practices are meant to provide foundational evidence for initial decision making, and should be supplemented with relevant evidence during the design/development, and implementation stages. Following a summary of individual-level recommendations and best practices for programs and policies targeting nutrition, physical activity and weight management, this chapter concludes with a number of recommendations for action in Alberta, which are based on the entire body of evidence summarized within this SA.

Individual Level Recommendations

As examined in previous chapters, there are substantial associations between nutrition, physical activity, weight management and risks of specific types of cancer, type 2 diabetes, and cardiovascular disease. These associations can be used as the basis for individual level recommendations for the prevention of these diseases.

Individual Nutrition Recommendations

For individuals, a diet that protects against the risks of the major chronic disease and supports overall health is characterized by:

Large amounts of vegetables and fruits

Adults should consume 7-10 servings of fruit and vegetables per day, with at least 5 servings of non-starchy vegetables and fruits.

Higher levels of vegetable and fruit consumption, specifically non-starchy fruits and vegetables, have a protective effect against several types of cancer that are common in Alberta. Since fruit and vegetables tend to have a lower energy density and higher fibre content, they are also aligned with recommendations for the prevention of type 2 diabetes and cardiovascular disease (American Diabetes et al., 2008; American Dietetic Association, 2005; Canadian Diabetes Association, 2008; Eyre et al., 2004; Goldstein et al., 2006). Eating Well with Canada's Food Guide emphasizes the importance of consuming this level of vegetables and fruit to meet nutrient requirements and reduce risks of other diseases as well.

The majority of adults in Alberta consume less than 5 servings of fruits and vegetables. The lowest levels of vegetable and fruit consumption are seen among men (versus women), adults aged 35-44, those with lower levels of education (e.g. high school education or less), those with lower total household income levels, and those with overweight and obese body weights. Individuals with these characteristics are important to target for health promotion interventions.

Sufficient amounts of dietary fibre

Adults should consume at least 25 grams of fibre per day by choosing fibre-rich foods such as fruits, vegetables, whole grain products, and pulses.

Foods containing dietary fibre have a protective effect against several of the more common types of cancer in Alberta. Similarly, dietary fibre is associated with a reduced risk of both type 2 diabetes and ischemic heart disease. Currently, less than 3% of Alberta adults consume levels of fibre at or above the adequate intake for this nutrient; thus, most individuals would benefit from an increased intake of dietary fibre. In addition to vegetables and fruit, intake of other high fibre foods such as whole grain products and legumes/pulses should be encouraged at levels recommended in Eating Well with Canada's Food Guide.

Moderate amounts of total dietary fat, and lower levels of saturated and trans fats

Total fat should contribute no more than 20-35% of total calories, while saturated fat should contribute no more than 10% of total calories (no more than 7% among individuals at high risk for type 2 diabetes or cardiovascular disease). Adults should also minimize their consumption of trans fats.

Dietary fat composition is an important risk factor for both type 2 diabetes and cardiovascular disease. A high saturated fat intake, accompanied by a relatively low intake of polyunsaturated fat has been associated with an increased risk of type 2 diabetes. Similarly, high levels of dietary saturated and trans fats are associated with increased risks of cardiovascular disease. While data on consumption levels of trans fat in Alberta is not available, in 2004, over 25% of Albertan adults obtained more than 10% of their daily calories from saturated fat (Statistics Canada, 2004a). Consistent with recommendations from Eating Well with Canada's Food Guide, adults should be encouraged to replace sources of saturated and trans fat in the diet (higher fat meat and dairy products, certain processed foods, foods containing partially-hydrogenated vegetable oils) with sources of mono and polyunsaturated fats including fatty fish, flaxseed, canola oil, olive oil, soybean oil, and nuts.

Moderate amounts of red meat

A maximum of one serving (2.5oz./75g) per day is recommended for adults.

Convincing evidence supports a positive relationship between red meat consumption and colorectal cancer, which is the third most common cancer in Alberta (Alberta Health Services – Alberta Cancer Board., 2008). Red meat, as an animal food, also contains saturated fat which has been associated with increased risks of both type 2 diabetes and cardiovascular disease. Although

data on current consumption levels of red meat is unavailable, the cultural acceptability of recommending strict limits on red meat consumption (particularly beef) may not be high; as such, Albertans should aim to consume moderate amounts of red meat (no more than one serving, as defined by Eating Well with Canada's Food Guide, per day).

Low in processed meats

Adults should only eat meats that have been smoked, salted, cured, or chemically-preserved rarely, if at all.

Convincing evidence supports a positive relationship between processed meats and colorectal cancer. Processed meats also tend to contain high levels of sodium which has been linked to stomach cancer, hypertension and cardiovascular disease, and can contain higher levels of total and saturated fat with, as discussed previously, influences diabetes and cardiovascular disease risks. Diets with high levels of animal fat are often high in energy, which increases risks of weight gain and associated diseases (World Cancer Research Fund & American Institute for Cancer Research, 2007).

Moderate amounts of alcohol

Females choosing to drink alcohol should consume 1 drink or less per day, while males choosing to drink alcohol should consume 2 drinks or less per day.

Alcohol is convincingly associated with an increased risk for several types of cancer that are prevalent in Alberta. In contrast, moderate alcohol consumption (1-2 drinks per day) has been associated with reduced risks of type 2 diabetes and cardiovascular disease. Yet when alcohol is consumed above a moderate level, detrimental health effects are observed. Consistent with recommendations from Canada's Low Risk Drinking Guidelines (Centre for Addiction and Mental Health, 2009), the Global Report, the Canadian Cancer Society, and other agencies, individuals who choose to drink should limit alcohol intake according to the above recommendation. Additionally, individuals who do not consume alcohol should not be encouraged to start for health purposes, and consumption above this recommended level should be discouraged.

Low in sodium

Adults should limit their daily intake of sodium to 2300mg/day.

Salt and salty foods are associated with a probable increased risk of stomach cancer. In addition, high sodium intake is associated with hypertension, cardiovascular disease and stroke (Institute of Medicine (U.S.). Panel on Dietary Reference Intakes for Electrolytes and Water, 2004). Significant proportions of Albertan adults consume levels of sodium greater than the recommended upper

limit. Albertan males have significantly higher sodium intakes than do Albertan females, making them an important target group for interventions in this area.

A variety of healthy foods, rather than single nutrients

Adults should aim to meet their nutrient requirements by choosing healthy foods, rather than dietary supplements.

Individuals should be encouraged to meet their requirements for all nutrients by choosing a variety of healthy foods as defined in Eating Well with Canada's Food Guide. Supplementation is required in certain segments of the population; however, these recommendations are also addressed within Eating Well with Canada's Food Guide. Evidence to recommend using dietary supplements for prevention of chronic diseases is not sufficient to justify the potential risks and adverse effects associated with high dose supplements.

Individual Physical Activity Recommendations

The benefits of physical activity for chronic disease prevention are well-established. There is substantial evidence that regular, moderate-level intensity exercise can improve cardio-respiratory fitness, improving aerobic power and maximum oxygen uptake, blood pressure and lipid levels and glucose tolerance, as well as psychological and physical well-being, and overall quality of life. When combined with a healthy diet (see above), physical activity can also contribute to weight loss and maintenance, which is an interrelated and independent factor for chronic disease risk. As such, achieving adequate levels of physical activity in individuals should be an essential component of interventions designed to improve control of body weight and prevent chronic disease.

Summarizing the associations between physical activity and chronic disease risk:

- Convincing evidence demonstrates that physical activity reduces the risk of colorectal cancer by 30% to 40%, breast cancer by 20% to 40%, while probable evidence suggests an inverse relationship between physical activity and the risk of endometrial cancer. More research is required to examine its association with several other cancers that are common in Alberta (World Cancer Research Fund & American Institute for Cancer Research, 2007; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).
- While the association between physical activity and reduced risk of type 2 diabetes is convincing, less is known about the optimal intensity, frequency, and duration of physical activity for diabetes prevention (Alberti et al., 2007; Bazzano et al., 2005; Steyn et al., 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). There does not appear to be a minimum

threshold of physical activity that needs to be achieved before protective effects are seen; rather, epidemiological evidence suggests that any increase in physical activity is associated with a reduced risk of type 2 diabetes when compared to a sedentary lifestyle (Gill & Cooper, 2008).

- Physical activity is convincingly associated with a reduced risk of developing cardiovascular disease and a marked decrease in cardiovascular-related and all-cause mortality for both men and women with reported risk reductions in the range of 20% to 50% (Nocon et al., 2008; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003). Being physically active on a regular basis also contributes to a state of physical fitness that can have protective effect against both CVD and IHD risk overall and as well as against individual risk factors such as hypertension and high cholesterol (Eaton et al., 1995).

Currently, nearly one half of Albertans report being inactive during their leisure time, or spending at least 15 hours per week being sedentary, indicating there is room for improvement in physical activity levels in many individuals. Consistent with recommendations from the Public Health Agency of Canada, and other health organizations, individuals should strive to meet the following guidelines for physical activity (Bassuk & Manson, 2005; Haskell et al., 2007; D. C. W. Lau et al., 2007; Public Health Agency of Canada (PHAC) & Canadian Society for Exercise Physiology (CSEP), 2006; Schulze & Hu, 2005; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003):

- ✓ Engage in 30-60 minutes of moderate level activity per day
- ✓ Limit sedentary behaviours

Adults should gradually build 30-60 minutes of moderate-level physical activity into their daily routines. As fitness level improves, individuals should progress towards 30 minutes of vigorous level activity per day. This activity can be accumulated in intervals of at least 10 minutes during the day during household, workplace, recreational, and transportation-related activities.

Physical activity and exercise therapy can also play an integral role in cardiac rehabilitation, especially for patients with hypertension, high blood lipids, and/or a family history of diabetes and cardiovascular disease. It should be noted, however, that the above recommendations for physical activity are intended for the well-population to reduce their risk of chronic disease. Individuals who are overweight and obese, already suffer from hypertension, high blood cholesterol and/or have a family history of diabetes and

cardiovascular disease including IHD, myocardial infarctions and congestive heart failure should first consult with a physician or other medical professional before attempting moderate or strenuous exercise and should probably avoid activities that involve (Ades, Waldmann, Polk, & Coflesky, 1992; Kohl, 2001; Maron et al., 2004):

- "Burst exertions" such as sprinting, basketball, soccer, and tennis;
- Extremely adverse environmental conditions characterized by greatly elevated locales with high humidity or substantial altitude and/or particularly cold temperatures (i.e., less than 0 degrees Celsius) because they may affect hydration, blood volume, and electrolytes; and,
- Exercise programs (even if recreational in nature) that require systematic and progressive levels of exertion and are focused on achieving higher levels of conditioning and excellence, as in road running, cycling, and rowing.
- Excessive participation in sporting activities that otherwise would be regarded as recreational if performed in moderation (e.g., downhill skiing continuously over an entire day versus more limited and selective skiing over the same time period); and,
- Extreme sports (such as hang gliding and bungee jumping) that require the expenditure of particularly substantial physical energy and incur psychological demands that are exceedingly unpredictable, placing individuals in compromised circumstances in which the likelihood of injury is substantial and the possibility of rescue from a traumatic or cardiovascular event is greatly reduced.

Physical activity should be an important component of any comprehensive chronic disease intervention strategy. Specifically, underlying barriers or impediments to being physically active should be addressed. Key target groups for interventions aimed at increasing levels of physical activity (e.g. segments of the population with the highest prevalence of physical inactivity) include older adults (age 55-64 years), individuals with the lowest levels of education, individuals with lower income levels, and individuals with higher body weights (Statistics Canada, 2008a). With respect to the latter group, regular, moderate-intensity physical activity enhances long-term weight maintenance, improves insulin sensitivity, glycemic control, and selected risk factors for cardiovascular disease (i.e., hypertension and dyslipidemia) (S. Klein et al., 2004a). However, for those individuals who are overweight or obese, initial physical activity should be modest and recreational, based on the patient's willingness and ability, gradually increasing in duration and frequency so that moderate to vigorous levels can be achieved for successful weight loss and maintenance.

Individual Weight Management Recommendations

The achievement and maintenance of a healthy body weight is one of the most effective ways to reduce the risk of chronic disease. Simplistically, weight loss is recommended for people who have a BMI or WC above the normal range, and can be accomplished through a combination of increased physical activity and/or decreased caloric intake; whereas for those who already have a normal BMI and WC, this requires balancing energy intake with energy expended during physical activity and metabolism (World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003).

Increases in BMI above the normal range are associated with an increased risk of chronic disease. Yet while the achievement of a BMI within the normal range may seem unrealistic for some overweight or obese individuals, it is important to realize that even a relatively small reduction in body weight (e.g. 5-10% of body weight) can substantially reduce the risk of specific cancers, type 2 diabetes and cardiovascular disease) (Alberti et al., 2007; Bazzano et al., 2005; D. C. W. Lau et al., 2007).

Convincing evidence demonstrates that overweight and obesity increases the risk diabetes and insulin resistance, cardiovascular disease, as well as pancreatic, colorectal, breast (postmenopausal), endometrial, and kidney cancer. These diseases account for a significant proportion of disease incidence and mortality in Alberta, making healthy weights an important focus of individual and population-level interventions. Consensus among the public health community in Canada and abroad suggests that individuals should strive to meet the following recommendations with respect to weight management (Alberti et al., 2007; Eyre et al., 2004; S. Klein et al., 2004a; Kushi et al., 2006; Steyn et al., 2004; World Health Organization (WHO) & Food and Agriculture Organization (FAO) of the United Nations, 2003):

- ✓ Achieve and maintain a health body weight, such that Body Mass Index (BMI) falls within the normal range of 18.5-24.9 kg² /m², preferably towards the lower end of the normal range.
- ✓ Adults who have a BMI>25 kg/m² should attain and maintain a normal BMI and/or a 5-10% reduction in body weight through a combination of diet and exercise.
- ✓ Weight loss should also be encouraged in men with a WC≥102cm and women with a WC ≥88cm, regardless of BMI status, given the independent associations of abdominal obesity with type 2 diabetes, ischemic heart disease and colorectal cancer, among others.
- ✓ Excessive weight gain should be avoided throughout the life course.

The majority of Albertan adults are overweight or obese (50.1% based on self-reported data and 60.9% based on measured data), making weight loss and management important areas for intervention. The prevalence of overweight and obesity is currently higher in Albertan men, while it is expected to increase for both sexes as the province's population grows older. Accordingly, adults of normal weight should be encouraged to maintain this body weight, and prevent the gradual weight gain that tends to occur during adulthood. Adults who are overweight and obese should be encouraged to lose weight through a combination of increased physical activity and reduced caloric intake. Some individuals may perceive the achievement of a normal BMI as unrealistic, but weight loss should still be encouraged as even small decreases in weight reduce health risks.

While the most common primary approach for achieving weight loss is therapeutic lifestyle change, which includes a reduction in energy intake and an increase in physical activity, truly effective obesity prevention and weight reduction strategies require a comprehensive approach, occurring at multiple levels of governance and across sectors (D. C. W. Lau et al., 2007). These recommendations are goals for individuals, but appropriate environmental supports and infrastructure, including parks and recreation infrastructure and programming, transportation strategies, community safety initiatives, food and nutrition initiatives, and healthy living and health promotion strategies (see pages 196-202), amongst others, must be in place for individual-level recommendations to be most successful.

Best Practice Recommendations for Interventions, Programs, and Policies

Effective interventions, programs and policies are necessary to create an environment that supports the adoption of individual-level recommendations related to nutrition, physical activity, and weight management by the population.

Evaluations or reviews of best practices for nutrition and physical activity interventions have been taken by Cancer Care Ontario (Sahay, Ashbury, Roberts, & Rootman, 2006), the Canadian Cancer Society (Knowledge Exchange Network, 2008a; Knowledge Exchange Network, 2008b; Knowledge Exchange Network, 2008e), the federal government of Australia (Bull, 2003), the Ontario Public Health Research and Education Department (PHRED) (Ciliska, Miles, O'Brien, Turl, & Donovan, 1999), and the Atlantic Health Promotion Research Centre (AHPRC) (Atlantic Health Promotion Research Centre, 2005b). The findings of these reviews were generally consistent and provide support for the best practice recommendations made below. The CCS and CCO reviews were particularly useful in formulating the recommendations. Although these reviews were completed with cancer prevention in mind, they focused on behavioural interventions targeting risk factors that are common to cancer, type 2 diabetes, and cardiovascular disease. As such, the findings from these reviews can be broadly applied to programs and interventions intended to prevent the major chronic diseases addressed in this situational analysis.

- The 2007 Cancer Care Ontario (CCO) review of international literature on nutrition and physical activity interventions was intended to provide CCO and its stakeholders with evidence on best practices for cancer and chronic disease prevention that would help in the design, implementation, and evaluation of interventions directed at a range of different populations (Sahay et al., 2006). In general, the results of the CCO best practices review suggest that effective nutrition and physical activity interventions balance research, theory and individual experience to promote the uptake and maintenance of health behaviours that can prevent cancer and other chronic diseases (Sahay et al., 2006).
- Similarly, the 2005 Canadian Cancer Society review of best practices for community and primary care-based nutrition, physical activity and alcohol interventions illustrated the information, skill-building, environmental and policy supports necessary to reduce chronic disease risk factors for the three respective areas. Effective interventions in this area were described as those resulting in increased individual and group intakes of fruit and vegetables and fibre, decreased intakes of fat and

cholesterol and/or increases in daily moderate to vigorous physical activity.

Evidence on interventions targeting chronic disease risk factors was also gathered from the Canadian Institute's of Health Research (CIHR) health-evidence.ca database. This database aims to "facilitate the adoption and implementation of effective policies/programs/interventions at the local and regional public health decision making levels across Canada" (Health-evidence.ca, 2009). Systematic reviews of the effectiveness of programs and interventions related to nutrition, physical activity and body weight that received 'strong' ratings (according to the health-evidence.ca quality assessment tool) were retrieved from this database and used to inform the following recommendations (Ciliska et al., 1999; Conn, Valentine, & Copper, 2000; Müller-Riemenschneider, Reinhold, Nocon, & Willich, 2008; Ogilvie et al., 2007; Pomerleau, Lock, Knai, & McKee, 2005).

Nutrition and Physical Activity Interventions

The findings of the reviews highlighted above were relatively consistent, and can be applied within the Alberta context to design and implement interventions, programs and policies that can effectively reduce chronic disease risk factors related to nutrition, physical activity and weight management. The recommendations from these reviews and relevant supplementary literature are discussed below.

The key components of effective interventions in each topic area utilize the following operational definitions for an intervention and a program (Knowledge Exchange Network, 2008a):

- **Intervention:** a group of different programs (components) within the same or related topic area(s), usually including a variety of information, skill-building and environmental supports.
- **Program:** a specific component of a multi-component intervention.

Best Practice Recommendations related to Intervention Design

- **Ensure that interventions are grounded in theories of behaviour change**

Reviews by the CCO, CCS, PHRED and AHPRC found that nutrition, physical activity, and health promotion interventions should be grounded in theories of behaviour change. Behaviour change theories are useful for addressing multiple influences on behaviours and tailoring interventions to the needs of different target groups or individuals (Atlantic Health Promotion Research Centre, 2005b; D. C. W. Lau et al., 2007). Examples of effective behaviour change theories include:

- **Social Cognitive Theory**, which recognizes that an individual's personal factors and environment (both social and physical) exist in a reciprocal relationship that reinforces influences on nutrition and physical activity behaviours.
- **Health Belief Model**, which postulates that for behaviour change to occur, an individual must believe that their health is at risk, perceive the risk to be serious, believe that the benefits of the health behaviour outweigh the costs, and feel the need to take action. This model can help tailor the content of health education interventions to participants' health beliefs.
- **Ecological Model**, which emphasizes the influence of the environment 'outside the individual' on behaviour, and considers the establishment of community partnerships necessary for removing barriers to participation in healthy eating and physical activity.

- **Tailor nutrition and physical activity information to individuals**

The CCO review concluded that nutrition and physical activity information within programs and interventions should be tailored to an individual's motivation, readiness and ability to change (stage of change). Consistent with other research and guidelines (D. C. W. Lau et al., 2007; Müller-Riemenschneider et al., 2008; Ogilvie et al., 2007; Pomerleau et al., 2005), CCS found that effective nutrition interventions must be tailored to the individual, and that physical activity interventions should have a flexible focus on participants' readiness to change, personal goals, and current activity and health status. The AHPRC review also emphasized the importance of considering an individual's readiness to change, as well as their ethnic, cultural, and demographic background prior to choosing an appropriate and tailored strategy for health behaviour change. Tailoring can be accomplished by computer applications, individual health advisors, individualized

feedback and prompts, or participants themselves through discussion of their needs, perceptions, barriers and motivations (Atlantic Health Promotion Research Centre, 2005b; Sahay et al., 2006). For example, as opposed to prescriptive, 'one-size fits all' dietary guidance within a nutrition intervention, goals for dietary improvement could be set based on an individual's current dietary habits, and willingness to change specific components of their diet.

- **Choose optimal settings for nutrition and physical activity interventions**

The CCO and AHPRC reviews emphasized the importance of choosing optimal settings for nutrition and physical activity interventions. For adults, worksites and churches are effective settings for nutrition interventions. By comparison, worksites, community and home are optimal for physical activity interventions (Knowledge Exchange Network, 2008e; Sahay et al., 2006).

- **Apply participatory methods during intervention development**

Adult participants can achieve a sense of program ownership and demand by participating in planning activities that involve all key stakeholders and are supported by a research team or program developer (Atlantic Health Promotion Research Centre, 2005b; Ciliska et al., 1999). Participatory approaches can often be seen through the formation of committees, workgroups, and community advisory groups within worksites, schools, churches and the community. Support should be provided in the form of guidance, technical expertise, and resources such as manuals and planning guides (Sahay et al., 2006).

Communication with program participants should occur on an ongoing basis throughout the planning, implementation and delivery phases of interventions (Atlantic Health Promotion Research Centre, 2005b).

- **Select appropriate intervention programs and strategies**

The CCO review recommends selecting an approach, or a mix of approaches, that is appropriate for the desired behavioural outcome, the setting, and the population of interest within both nutrition and physical activity interventions. Consistent with their theoretical foundations, both nutrition and physical activity interventions should target behaviour change as an outcome (Ciliska et al., 1999; Knowledge Exchange Network, 2008a; Knowledge Exchange Network, 2008b). Supporting behavioural skill training is an important strategy within physical activity interventions, and can be accomplished through self-monitoring, self-reward, positive self-talk, structured problem solving, and relapse prevention (Conn et al., 2000; Knowledge Exchange Network, 2008b). The importance of employing multiple programs and

strategies within nutrition and physical activity interventions is highlighted within multiple reviews (Bull, 2003; Ciliska et al., 1999; Knowledge Exchange Network, 2008a; Knowledge Exchange Network, 2008b; Pomerleau et al., 2005). Additionally, individual-level behaviour changes can be encouraged through organizational or community-level policies that create supportive environments for such behaviours (Atlantic Health Promotion Research Centre, 2005b).

Effective nutrition interventions should include one or more of the following programs (Knowledge Exchange Network, 2008a; D. C. W. Lau et al., 2007; Pomerleau et al., 2005):

- Structured dietary advice in primary care from an experienced health professional (preferably a registered dietitian);
- Print material distribution, either tailored and/or standardized;
- Group educational and skill-building sessions; and,
- Adherence or maintenance programs.

Effective physical activity interventions should include a recommendation for regular brisk walking, environmental supports for the recommendations, and one or more of the following programs (Bull, 2003; Conn et al., 2000; Knowledge Exchange Network, 2008b; Ogilvie et al., 2007):

- Small group educational sessions that promote adherence and problem solving;
- Individual counseling and/or personal training;
- Prompting programs;
- Use of a general practitioner and other health professionals for support and influence; and,
- Exercise programs.

■ **Design interventions that foster social support**

Personal contact and social support can be used to encourage intervention participants to make positive behaviour changes (Atlantic Health Promotion Research Centre, 2005b; Bull, 2003; Ciliska et al., 1999; Sahay et al., 2006). For adults, coworkers, small groups and one-to-one lay health advisors are effective. A related-recommendation within the CCO was to involve parents in interventions for children and adolescents, which highlights the importance of family support in promoting nutrition and physical activity behaviour change.

Best Practice Recommendations related to Intervention Implementation

- **Provide adequate training for intervention delivery personnel**

The CCO, CCS, and Australian Government reviews state that training of intervention or program delivery staff is an essential component of effective interventions in nutrition and physical activity. Both initial and ongoing training are necessary and can be offered in the form of workshops, supervision, site-visits and correspondence (such as conference calls, web-seminars and emails).

- **Ensure that interventions are of sufficient intensity and duration**

Nutrition, physical activity and combined interventions must be of sufficient intensity (strength, in amount or degree) and duration (length of time during which it happens) to be effective (Atlantic Health Promotion Research Centre, 2005b; Conn et al., 2000). The CCO review recommends that nutrition interventions designed to change dietary behaviour last 3 to 5 months for behaviour change to occur, while physical activity health communication campaigns need to be greater than 5 months, even when intensity is high. The CCS and PHRED reviews state that higher intensity nutrition intervention are more effective, particularly for individuals and populations who are at higher risk for nutrition-related chronic diseases or other conditions.

- **Engage and retain participants throughout the intervention**

The CCO and AHPRC reviews state that incentives are effective for participants to be engaged and retained in an intervention. Personal contact, feedback and prompts can help to maintain participant interest and enthusiasm, especially for individuals, families, and obese and sedentary populations (Atlantic Health Promotion Research Centre, 2005b; Sahay et al., 2006). Adherence or maintenance programs are important components of nutrition interventions, and regular follow-up through personal, phone, or email contact with participants in physical activity interventions is an important contributor to effectiveness (Knowledge Exchange Network, 2008a; Knowledge Exchange Network, 2008b; Müller-Riemenschneider et al., 2008).

Best Practice Recommendations related to Intervention Evaluation

- **Use self-reported and objective measures to evaluate interventions**

Evaluation of programs and interventions is critical for demonstrating their effectiveness and informing future work in the area (Atlantic Health Promotion Research Centre, 2005b; Bull, 2003). The CCO review recommends combining self-reported and objective measures when evaluating nutrition and physical activity interventions. Examples of

self-report measures include self-reported vegetable and fruit consumption, participation in leisure-time physical activity and Body Mass Index (BMI) determined using self-reported height and weight. Examples of objective measures include direct observation (e.g., food selection and consumption, physical activity participation, etc.) and direct measurement (e.g., pedometer readings, heart rate monitoring, height and weight, etc.).

- **Measure mediating variables of behaviour change**

While the intended final outcome of nutrition and physical activity interventions should be changes in health behaviours (Ciliska et al., 1999), the CCO review also recommends measuring mediating variables of behaviour change. Measuring these variables is important for detecting the beginnings of behaviour change early in the intervention, and allowing modifications to be made if necessary. Evaluating the short term impact of an intervention can ensure that progress towards long-term goals is made (Bull, 2003).

Alcohol Programs & Interventions

There is strong evidence that primary-care based interventions are effective in decreasing alcohol consumption in adults if they involve direct advice from a general practitioner or other health professional and are supplemented by follow-up contact and supported by self-help materials (Knowledge Exchange Network, 2008f). Evidence to support effective community-based alcohol interventions is currently in short supply.

Nutrition and Physical Activity Policies

For recommendations and best practices made for policy work, the definition of a public health policy, as any work that seeks to “improve or enhance the health of the population and reduce health disparities” through legislative action at the local, provincial or federal levels, should be considered (Government of Canada Senate, 2008).

Best Practice Recommendations for Nutrition Policy

Evidence-based policy recommendations and best practices for nutrition and healthy eating should increase the consumption of healthy foods among various groups and within different settings, where appropriate. Several systematic reviews provide support for lowering the price of healthy foods and prompting tax increases on unhealthy foods (Rutledge & Raine, 2005). This incentive / disincentive approach, however, has had mixed results and studies have shown that while lower healthy food prices will increase their sales, tax increases on unhealthy foods are unlikely to affect sales and consumption.

Based on evidence from the Centre for Disease Control and Prevention (CDC), the World Health Organization (WHO), and the World Cancer Research Fund (WCRF) and American Institute for Cancer Research’s Global Policy Report, AHS’ Health Promotion, Disease and Injury Prevention also recommends that any policy on nutrition, regardless of its setting, should (Knowledge Exchange Network, 2008c; World Cancer Research Fund & American Institute for Cancer Research, 2009):

- Encourage public commitment for promoting proper nutrition and consumption of foods that are both healthy and appealing;
- Develop and utilize food preparation, product packaging, and food advertising and marketing guidelines directed towards entire communities and at-risk groups; and,
- Establish direct links with nutrition service providers, such as dietitians and community nutritionists, and their affiliated groups and/or organizations (Knowledge Exchange Network, 2008c; World Cancer Research Fund & American Institute for Cancer Research, 2009).

For nutrition policies enacted and maintained within schools and workplaces, respectively, it is recommended that both settings increase the availability of healthy foods in lunches and vending machines and offer complementary and free programs and education such as point-of-purchase information, nutrition label-reading education sessions, and cooking classes that use healthy foods, ideally taught by dietitians and focused on skill building (Knowledge Exchange Network, 2008c; World Cancer Research Fund & American Institute for Cancer Research, 2009).

Additionally, a nutrition policy working group, similar to Health Canada's Office of Nutrition Policy and Promotion (ONPP), should be established in Alberta to ensure that nutrition research findings which are provincially relevant are applied in the most appropriate way to benefit the health of Albertans. Mirroring the processes developed by the ONPP, this proposed group would ensure that all dietary guidance and nutrition policy in Alberta is evidence-based and gives Albertans clear, consistent and accurate messages by (Health Canada, 2006.):

- Developing and revising dietary guidance policies for Albertans based on current scientific knowledge;
- Establishing required standards and putting forth relevant positions regarding issues of nutritional importance; and
- Developing strategic plans to support the development of provincial policies and contributing to related departmental initiatives.

It is also necessary to ensure that key partnerships are established between various population health portfolios within AHS. Given the new AHS organizational structure and the critical role of nutrition in the prevention of chronic diseases, a strategy for ongoing collaboration between HPDIP and Nutrition & Food Services Population and Public Health is necessary. Such a partnership will facilitate the joint creation of strategic documents, as well as the planning and development of Alberta-wide strategies and initiatives related to nutrition.

Best Practice Recommendations for Physical Activity Policy

Policy recommendations and best practices that have proven actionable and effective for increasing physical activity and decreasing sedentary behaviour among communities and at-risk groups involve (Knowledge Exchange Network, 2008d; World Cancer Research Fund & American Institute for Cancer Research, 2009):

- Improvement of the built environment and the creation or enhancement of places or locations where physical activity can occur;
- Point of use prompts (e.g., stairs);

- School physical education policies;
- Workplace physical activity policies; and,
- Industry policy.

The creation of walkable communities is a frequently made recommendation in the context of disease prevention and is supported by evidence that “residents of walkable neighbourhoods do have a greater chance of achieving recommended levels of physical activity and of maintaining a healthy body weight than those in low-density, single use environments.” (Frank, Andresen, & Schmid, 2004) Walking is a multi-contextual physical activity that can be performed during leisure-time, at work and home, and as form of active transportation. Interventions tailored to people’s needs, targeted at the most sedentary or at those most motivated to change and delivered to individuals, households, or groups, can increase walking by up to 30-60 minutes a week on average(Ogilvie et al., 2007). It is also recognized that pedometer-based walking interventions have shown significant increases in walking behaviour (W. J. Brown, Mummery, Eakin, & Schofield, 2006). Much of the evidence for walking interventions has been based on efficacy trials only, sustainability of the behaviour long term (12 months or more) remains to be demonstrated and little is known about the effectiveness of walking interventions at a population level(W. J. Brown et al., 2006). Accordingly, it is clear that longer-term interventions, both program and policy based, focusing on sustainable individual, social, and environmental change strategies are needed to promote and enable walking.

In general, programming and policy work designed to improve the nutrition, physical activity and weight management behaviours of Albertans must be evidence-based and reinforce the importance of improvements in leading a healthy lifestyle and reducing the risk of chronic disease. It must also be based on a thorough understanding of people’s motivations, lifestyle preferences and day-to-day life circumstances.

Recommendations for Action

To date the majority of initiatives implemented by Alberta Health Services and its partners have concentrated mainly on the treatment and management of various chronic diseases such as cancer, type 2 diabetes and cardiovascular disease. What is now needed is a significant shift in focus and ideology towards the primary and secondary prevention of disease through actions and initiatives that are comprehensive and integrated across all of AHS' zones, operational divisions and portfolios. By themselves, these initiatives cannot change individual behaviour, but if they are aligned with each other and complementary to community actions conducted in various sectors (i.e., private and public sectors) they can be successful (International Union Against Cancer, 2004.).

With respect to the individual-level recommendations made above, it is important that these are communicated together both effectively and consistently within all programs that are directed at improving the nutrition, physical activity and weight management behaviours of Albertans. Not only are these individuals recommendations beneficial for their separate areas of concern, but when taken together, they essentially form an assembly of behaviours that contribute to an overall healthy lifestyle that can prevent the onset of most chronic diseases. When considered alongside the best practice recommendations made above and the recommendations for action that follow, it must also be recognized that Albertans need a great deal of macro-level support to enable them to make healthy choices standard practices in their lives. Accordingly, groups within and in partnership with Alberta Health Services should create functional partnerships and working groups to accomplish a number of recommendations for action, which include:

The creation of new baseline measures and indicators to coincide with the surveillance and monitoring of existing targets for chronic disease prevention.

In order to prevent increases in chronic disease incidence, prevalence and related mortality, Alberta Health Services needs a comprehensive set of measurable goals, indicators, and targets that are related to the prevention and reduction of chronic diseases. These measures should focus both on indicators of outcome (such as disease incidence and mortality), but also intermediate or conditional indicators, including risk factors, including those examined within this report and others, that have demonstrated linkages to the development of disease or other health outcomes.

Not only would these indicators allow for the measurement of progress and the identification of health inequities to inform future prioritization to improve the health of Albertans, they will also allow AHS' chronic disease prevention partners across to work towards similar goals and targets. Ideally, these indicators should be able to measure and assess the health of individual municipalities and communities, in addition to each of AHS' five health zones and the province as a whole.

The establishment of a central body (group, collective or organization) to independently collect and manage innovative health data and provide to access to data from external sources.

In order to present the most current data about three different chronic diseases and a multitude of health behaviours several data sources were used. While this is often the case for conducting foundational research, having multiple data sources to draw from can be quite challenging in terms of access, ethics, and analysis and data comparability. As a recommended alternative, having a centralized body responsible for data collection, analysis and reporting, as well as establishing and furthering existing partnerships with external organizations of varying scope and expertise, has the potential to create innovative practices in the monitoring and surveillance of health data that can inform decisions about health policy and health education. For this proposed data body to work effectively, ethical considerations, in addition to individual privacy and disclosure laws (e.g., FOIP) must be fully taken into account.

- Conducting more foundational and applied research to examine the key target populations of AHS and its partners, which include but are not limited to:
 - Rural Albertans, in particular residents of AHS' newly established North, Central and South zones;
 - Aboriginal Populations; and,
 - Young Adults, in particular those between 18 and 35 years of age.

Accurate characterization of target populations, in terms of their demographics, behaviours and values, is a first step to providing customized health promotion and disease prevention strategies that are both culturally and contextually appropriate. Coinciding with AHS' view that patients are partners in their care and need to be involved in decision-making, the research that is still required must incorporate both traditional paradigms (e.g., quantitative and qualitative methods) and less traditional evidence gathering techniques (e.g., community engagement and consultation forums, the formation and operation of health advisory councils).

The application of robust and critically reviewed evidence within the development, implementation and evaluation of programs, policies and initiatives targeting chronic disease prevention.

In order to create macro-level changes to the province's social and physical environments to allow Albertans to lead healthy lifestyles, meaningful evidence from standardized, epidemiological and empirically-based sources needs to be critically-appraised and applied within initiative planning, implementation and evaluation. For instance, innovative techniques such as cost-benefit and return-on-investment (ROI) analyses should be considered, in addition to objectives-based, decision-oriented and patient-centered planning and evaluation approaches, for a wide-range of initiatives to assess their short or long-term fiscal feasibility.

The completion of a comprehensive review of policy alternatives intended to improve dietary habits, activity levels and rates of overweight and obesity in the population.

Provincial and municipal scans completed for this report revealed that a substantial proportion of the resources allocated to primary prevention in Alberta go towards the promotion of healthy eating and physical activity, and related education and awareness-raising strategies. Additionally, the policy scan completed by the Canadian Partnership Against Cancer (CPAC) illustrated that Alberta, when compared to other provinces, has considered or adopted relatively few policy-based initiatives targeting nutrition, physical activity, and excess body weight. While education and promotion-based activities are important in certain contexts, they focus largely on improving individual behaviours and fail to address the broader-level social and environmental determinants of health. It is clear that comprehensive policy-based solutions are needed to create an environment that enables Albertans to adopt and sustain healthy lifestyles. The policy-related research in this report provides a general overview of this area, however, more in-depth and focused investigation is required to determine which policies are most appropriate and likely to have the greatest impact on population health and health behaviours in Alberta.

It is recommended that a policy review be undertaken to examine policy alternatives that have been implemented in other jurisdictions of Canada, as well as other countries, with comparable nutrition and physical activity behaviours and chronic disease outcomes. Furthermore, a consideration of policy alternatives outside the health sector is essential. Health behaviours related to nutrition and physical activity are influenced by many factors

including socioeconomic status, education and literacy levels, housing and residential circumstances, and working conditions, amongst others. A comprehensive approach to improving nutrition, physical activity, and body weights through policy will surely require investment in all of these areas, in addition to policies that directly target the primary prevention of chronic disease. Within this review, policy alternatives should be compared and evaluated in term of a number of criteria, including (but not limited to):

- Policy effectiveness, as demonstrated through high quality evaluation;
- Cost effectiveness and predicted return on investment;
- Relevance, applicability, and appropriateness for the Alberta context;
- Current political and public support for or against the policy; and,
- Target population(s), identified according to who is likely to benefit most and who will receive the least benefit from the policies themselves.

The establishment of a cross-sectoral organization capable of working collaboratively and dedicating sustained time and resources to reduce chronic disease through primary prevention.

There are currently many different organizations working to prevent chronic disease in Alberta; however, it is less clear how and whether these organizations are working together. Effective chronic disease prevention requires coordinated program and policy efforts by multiple stakeholders and policy decision-makers. Alberta requires a functional, cross-cutting organization of chronic disease stakeholders who can devote real time and resources to improve the health behaviours and chronic disease outcomes of the province's population. Similar groups have been established in other Canadian provinces, including the BC Healthy Living Alliance and the Ontario Chronic Disease Prevention Alliance; and Alberta could develop a similar, but provincially-relevant and focused organization using these organizations as models.

Such an organization will require sustained funding (possibly from the government) and membership, as effective chronic disease prevention requires long-term financial commitments. Measurable goals, objectives, actions, outcomes, and priorities will also be critical to ensuring that this organization is functional and truly contributes to chronic disease prevention. This organization will ideally provide a venue through which chronic disease stakeholders can exchange knowledge related to their activities occurring throughout the province; and, as a result of this improved communication,

there will a reduction in the duplication of efforts and a promotion of synergies among different groups working towards similar goals.

The creation of comprehensive, long-term strategy for obesity prevention and reduction in the province of Alberta.

The majority of Albertan adults are overweight or obese, and, of the risk factors reviewed in this report, excess weight has the largest and most convincing associations with risks of cancer, type 2 diabetes, and cardiovascular disease. The province of Alberta requires a comprehensive, long-term strategy for obesity. Ideally, this strategy would target the entire population, as excess weight is a significant health concern for children, youth and adults alike. Among Albertan adults, the prevalence of excess weight increases by over 20% between the ages of 25 and 54 years and evidence indicates that even modest amounts of weight loss (5-10% of body weight) are associated with significant improvements in health outcomes; thus, it is essential that programs and policies in this area address both prevention of weight gain, and reduction of excess weight.

The initiatives proposed under this recommended strategy must be sustainable over the long-term, as reductions in overweight and obesity will not occur quickly. Additionally, such a strategy must include broader policy-type initiatives that reach the entire population, as well as targeted interventions for higher risk groups, such as those identified in this SA and other literature (e.g. Aboriginal populations, rural Albertans, young to middle aged adults who tend to gain weight).

The recent creation of Alberta Health Services provides an opportunity to align and build upon all past or current initiatives related to obesity reduction and control that are occurring in different regions of the province across AHS' different divisions and portfolios. A necessary first step in the development of this strategy is the coordination of stakeholders from relevant provincial groups from within and external to AHS, including (but not limited to): Alberta Health and Wellness, AHS Health Promotion, Disease and Injury Prevention, AHS Nutrition and Food Services, members of the academic community engaged in relevant research and programming, municipal, community and zone-based stakeholders, AHS Chronic Disease Management, AHS Community and Rural Health and others.

The development, implementation and evaluation of an evidence-based provincial workplace program intended to improve the nutrition, physical activity, and weight-related behaviours of Albertan adults.

As evidenced in this report, Albertan adults have poor dietary habits and high levels of physical inactivity, overweight, and obesity. Despite the fact that these factors have a substantial impact on risks of developing cancer, type 2 diabetes, and cardiovascular diseases, adults are rarely targeted with chronic disease prevention activities. Instead, the focus of chronic disease programming for adults tends to be more on disease treatment and management. The Government of Alberta has recognized the importance of primary prevention in settings where children spend a significant amount of time, as demonstrated by the implementation of specific nutrition and physical activity policies in schools.

Choosing optimal settings for interventions among adults is equally important. Workplaces have been identified as effective settings for interventions designed to improve health behaviours among adults, which is an essential component of primary chronic disease prevention. Ideally, a workplace program should incorporate strategies intended to not only increase healthy eating behaviours and physical activity levels, but also intentional efforts to reduce obesity and prevent weight gain. This will require careful consideration of all factors related to Alberta's workplaces. A substantial amount of foundational research is required to determine the optimal type(s) of workplace programs and policies within the Alberta context. If considered, it should be anticipated that any workplace-based initiative will be challenging due to the diverse nature of Alberta workplaces, variations in employee populations of different work environments, the fact that adults, compared to school-children, are a less captive audience, and other factors. Although these challenges represent important considerations within the program planning and development process, they should not impede action in this critical area.

Improved municipal and community engagement for disease prevention through fostering both new and established functional partnerships.

Within Alberta's municipalities there is currently an abundance of parks and recreation infrastructure and programming, while there are very few food and nutrition, community safety, transportation, and health promotion initiatives currently being implemented at the municipal level (see Chapter 5). Yet despite differences in the distribution of municipal initiatives, many of the existing activities do not incorporate improved health status of community members as either a primary goal or operational mandate. For example, the majority of food and nutrition initiatives at the municipal-level across the province are focused on the production and sale of local and organic foods, as well as the promotion of farmers markets. Although these initiatives are important for multiple reasons, they are not approached with health outcomes in mind. As recommended alternatives to current municipal practices, it is important to advocate for healthy lifestyle practices that can be accomplished where people

are at in their lives geographically, financially, socially, and personally. This advocacy can be done via:

- Centrally organized (ideally by Alberta Health Services), but municipally-specific public awareness campaigns that emphasize the importance of a nutritious diet, limited-to-moderate alcohol consumption, and daily physical activity, which can all contribute to the prevention of obesity;
- Provincial and municipal legislation that bans the use of trans-fats in restaurants, regulates promotions at point of sale for energy-dense and fast foods, and leads to changes in the built environment to increase physical activity through active transportation;
- Training for all health professionals, internal and external to AHS, to become influential roles models in their communities.

In order to further align AHS' future municipal efforts and practices with the current priorities of Alberta's municipalities, several comprehensive recommendations can be made. The following recommendations are grouped according to the different areas of interest presented in Chapter 5.

Parks & Recreation Infrastructure and Programming

Current Priorities:

Physical activity and fitness programming for children, adults and seniors; and,

The maintenance and construction of fitness facilities, including sport parks, arenas and aquatic centres.

Recommendations:

Increase public levels of awareness and support for physical activity at home, work, and as a mode of transportation; and,

Promote walking as a physical activity and the organization of walking groups.

Transportation Strategies

Current Priorities:

The promotion of built and natural infrastructure for non-motorized transportation such as walking and bicycling; and,

The maintenance and improvement of roadways and related infrastructure.

Recommendations:

Increase the promotion of non-motorized and public transportation, respectively; and,

Develop strategies and/or policies for eco-friendly transportation.

Community Safety Initiatives

Current Priority:

The maintenance of safe transportation networks and routes with unobstructed views and adequate lighting.

Recommendation:

Develop a provincial municipal-level community safety strategy for the development and implementation of formal community safety plans.

Food & Nutrition Initiatives

Current Priorities:

The promotion of alternative food sources and suppliers, such as farmer's markets, specialty stores, and/or organic gardening; and,

Municipal support for community gardens and agricultural initiatives.

Recommendations:

Increase the availability of and accessibility to healthy foods; and,

Develop a provincial municipal-level strategy, encompassing programmatic and policy-focused initiatives, to promote awareness and knowledge of healthy portion sizes and nutritional labeling.

Healthy Living and Health Promotion Strategies

Current Priority:

Policies and programs supporting environmental protection and conservation.

Recommendation:

Develop provisions and guidelines that promote healthy body weights (through improved nutrition and increased physical activity), limit the consumption of alcohol and support breastfeeding practices and other healthy living practices.

Summary & Conclusions

Overall, a healthy diet, regular leisure-time physical activity and a healthy body weight have the potential to prevent a significant proportion of chronic disease incidence and mortality in Alberta. A recent large-scale cohort study found that individuals who did not use tobacco, had a BMI below 30 kg/m², engaged in 3.5 hours of physical activity per week, and had high intakes of fruit, vegetables and whole grain bread, and low intakes of meat had a 78% lower risk of developing a chronic disease than those who engaged in none of these healthy behaviours (Ford et al., 2009). Specifically, these 4 behaviours were associated with a 93% reduction in incidence of type 2 diabetes, an 81% reduction in incidence of myocardial infarction, a 50% reduction in incidence of stroke, and a 36% reduction in incidence of cancer (Ford et al., 2009). These findings are consistent with evidence presented in earlier chapters that demonstrate the potential reduction in major chronic diseases that could be achieved through modification of risk factors related to nutrition, physical activity, and weight management.

This Situational Analysis found that while a great deal of work in the areas of nutrition, physical activity and weight management is currently being performed, the relevant health behaviours of Albertans need to improve. An examination of current health perceptions, behaviours and body weight statuses in Alberta provides a starting point for creating feasible individual and population level recommendations and goals for nutrition, physical activity, and body weight that will effectively contribute to reduced incidence and mortality from cancer, type 2 diabetes, and cardiovascular diseases in the future. Supportive programmatic and policy structures need to be created to leverage national, provincial, regional and municipal strengths and assets and fulfill needs that meet cancer prevention objectives. Alberta Health Services' Health Promotion, Disease and Injury Prevention is committed to providing leadership and coordination across the province for enhanced capacity, partnerships and community development that will help Albertans increase and maintain their uptake of healthy eating and regular physical activity.

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