Chronic Disease Prevention Primer

Prepared by:

Propel Centre for Population Health Impact

last updated March 2015

Version 2.0
# Contents

**Waterloo CDP Initiative: Chronic Disease Prevention Primer** .............................................................................................................. 1  
Chronic Disease: A Serious and Urgent Problem ................................................................................................................................. 1  
  
*Facts about the determinants of chronic disease* .............................................................................................................................. 1  
**Action against Chronic Disease** ......................................................................................................................................................... 2  
  
*What can be done at the societal level?* .................................................................................................................................................. 2  
*What can be done at the community level?* ........................................................................................................................................ 2  
*What can be done at the individual level?* ........................................................................................................................................ 2  
**“Top Four” Chronic Diseases and Risk Factors** ......................................................................................................................................... 4  
**Burden by Chronic Diseases** ............................................................................................................................................................... 5  
**Burden by Risk Factors** ........................................................................................................................................................................ 10  
**Prevention Research is Key** ................................................................................................................................................................. 14  
**University of Waterloo’s Chronic Disease Prevention Initiative (CDPI)** .............................................................................................. 16  
**Waterloo CDPI Seed Grant Funding** ..................................................................................................................................................... 16  
  
*Seed Grant Objectives* ........................................................................................................................................................................... 16  
*Details of the Award* .............................................................................................................................................................................. 16  
**Chronic Disease Prevention Research External Funding Sources** .................................................................................................. 17
Waterloo CDP Initiative: Chronic Disease Prevention Primer

Chronic Disease: A Serious and Urgent Problem

Chronic diseases, including heart disease, cancer, stroke, diabetes and respiratory illnesses, top the global health agenda. In 2012, 38 million or 68% of all deaths worldwide were due to chronic disease. It is projected that by 2020, chronic disease will account for almost three-quarters of all deaths worldwide. Chronic disease epidemics take decades to become fully established – they have their origins at young ages.

In Canada, few people are untouched by chronic disease or injuries: three out of five people over the age of twenty live with one of these diseases, and four out of five are at risk. Of the 219,500 deaths due to non-communicable diseases (NCD) in 2012 in Canada, 26.98% were premature, affecting people under 70 years of age.

Ontario lags behind Canada’s healthiest provinces. In Ontario, chronic diseases (heart disease, cancer, stroke, diabetes and respiratory illnesses) are the leading cause of preventable death accounting for 79% of all deaths.

Chronic disease is described as a complex problem because of the inter-dependence of so many disease determinants, originating at so many levels, from individual behaviour to global wealth distribution. Determinants of chronic disease include genetics, epidemiology, environment, social inequity, health literacy, behavioural risk factors and lifestyle which include the social networks that influence our attitudes on health.

Facts about the determinants of chronic disease

- Modifiable health risk factors – including tobacco use, unhealthy diets, physical inactivity, and harmful use of alcohol – are responsible for much of the illness, suffering, and early death related to chronic diseases.
- Lifestyle-related disease is a term used to describe the influence of behaviour on the development of chronic diseases. However, these diseases are strongly influenced by factors including social and economic conditions, environment, culture (practices, norms, and values) and urbanization and are therefore not the result of individual choices alone.
- Vulnerable populations such as ethnic minorities, immigrants, young people and the poor bear the greatest burden of disease.
- Critical knowledge gaps exist on the role of gene-environment interactions in the development of chronic disease. Interdisciplinary research collaboration is necessary to unravel the effects of environment and genes on chronic disease.
- In 2008, ninety per cent of premature deaths from chronic disease (before the age of 60) occurred in low- and middle-income countries.
- There is recent evidence that chronic diseases have significantly detracted from economic growth in high-income countries.

The purpose of this primer is to provide relevant global, national and provincial facts and figures on the burden of chronic disease. It focuses on prevention research in support of the work of the Waterloo Chronic Disease Prevention Initiative whose mission is to reduce the burden of chronic disease by advancing research in chronic disease prevention in Canada and around the world.
Action against Chronic Disease

The World Health Organization underlines the importance and urgency of population-wide approaches to address chronic disease prevention with prevention research identified as an essential component of the approach.\(^{15}\) Recognizing the complex interrelationships of risk factors and conditions is the basis for an integrated approach to chronic disease at the levels of society, community and the individual.\(^{1,11,12}\)

*What can be done at the societal level?*

Tobacco control is an often cited example of a comprehensive, long-term approach that has been successful in reducing tobacco use and tobacco-related illnesses.\(^{15}\) In Canada, similar actions have not been applied to alcohol, despite an ambitious National Alcohol Strategy released in 2008.\(^1\)

With respect to childhood obesity, in Canada, there have been promising inroads, such as the federal child-fitness tax credit and a commitment by the Ontario government to reduce childhood obesity.\(^1\) However, food industries are still allowed to decide what measures they will take to reduce marketing of unhealthy products to children.\(^1\)

Public policy and governmental interventions should be aimed at modifying current policies and practices and creating an environment to promote healthy behaviours in individuals.\(^1\) Lessons learned from tobacco control initiatives can be applied to other issue areas.\(^{15}\)

*What can be done at the community level?*

Emerging research has explored the effect that social networks have on health-related behaviours such as smoking, drinking, eating and exercising. Increased access to affordable products and services including exercise facilities, team sports, healthy food and support groups to quit smoking and tackle obesity all have the potential to raise awareness and create a support network that enables health.\(^{1,11,16}\) Community engagement in the planning, implementation and evaluation of health initiatives builds community capacity to create sustainable changes.\(^{16}\) More can always be done to make health a priority for all and especially for marginalized and the most vulnerable populations including ethnic minorities, immigrants, young people and the poor.\(^{1,12}\) This can be addressed by setting explicit targets aimed at reaching these populations.\(^1\)

*What can be done at the individual level?*

While some risk factors, such as age, sex, and genetic make-up, cannot be changed, many behavioural risk factors can be modified.\(^{11}\) Empowerment of individuals is critical to help manage their conditions through lifestyle changes and adherence to treatment regimens.\(^1\) When more is done to empower individuals, health resources can be maximized and health authorities are better able to allocate resources where needed, especially in times of fiscal restraint.\(^1\)
“Top Four” Chronic Diseases and Risk Factors

The “top four” chronic diseases: cancer, diabetes, cardiovascular disease (heart disease and stroke) and lung disease are the leading causes of preventable death and disability worldwide and are largely caused by four behavioural risk factors: tobacco use, physical inactivity, unhealthy diets and the harmful use of alcohol. The burden of these “top four” diseases and risk factors are a substantial problem globally, nationally and provincially. These “top four” diseases and risk factors, along with mental illness, will cost the developing world $21 trillion over the next two decades. Table 1 demonstrates the overlap of risk factors on chronic diseases highlighting the “top four”.

<table>
<thead>
<tr>
<th>Table 1: “Top Four” Chronic</th>
<th>Tobacco Use</th>
<th>Unhealthy Diets</th>
<th>Physical Inactivity</th>
<th>Harmful Use of Environment</th>
<th>Genetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular Disease</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Diabetes</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Cancer</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Chronic Respiratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Illness</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Bone &amp; Joint Diseases</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Oral Diseases</td>
<td>☒</td>
<td>☒</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vision Loss/Blindness</td>
<td>☒</td>
<td>☒</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hearing Loss/Deafness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information Sources:

1 PHAC: Healthy living can prevent disease
2 WHO: Global status report on non-communicable diseases 2010
3 The Global Economic Burden of Non-communicable Diseases 2011 (Bloom et al.)
4 Table 1 adapted from: WHO – Non-communicable Diseases

Additional resources:

Environmental Determinants of Chronic Disease and Medical Approaches 2012
Early Exposures to Hazardous Chemicals/Pollution and Associations with Chronic Disease 2011
Canadian Institutes of Health Research (CIHR): Environment, Genes and Chronic Disease 2012
Canadian Mental Health Association - Ontario
The Effects of Smoking on Bone Health
Body Mass Index, Waist Circumference, Physical Activity, and Risk of Hearing Loss in Women
Obesity is associated with sensorineural hearing loss in adolescents
Burden by Chronic Diseases

In addition to heart disease, cancer, stroke, diabetes and respiratory illnesses, there are many other chronic conditions and diseases that contribute significantly to the burden of disease on individuals, families, societies, and countries. Examples include mental disorders, vision and hearing impairment, oral disease, bone and joint disorders, and genetic disorders.\(^3\)

**Cardiovascular diseases (CVDs)**

- Cardiovascular diseases are the **number one cause of death** globally: more people die annually from CVDs than from any other cause. An estimated **17.5 million** people died from CVDs in 2012, representing 31% of all global deaths.\(^1,2\)
- Most CVDs can be prevented by addressing risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, high blood pressure, diabetes and raised lipids.\(^1\)
- In 2011, heart disease and stroke were two of the three **leading causes of death** in Canada; 22.4% of all female deaths and 25.8% of all male deaths.\(^3\)
- In 2005, heart disease and stroke cost the Canadian economy **$20.9 billion in mortality costs**, physician services, hospital costs, lost wages and decreased productivity.\(^4,5\) In 2020, total costs are expected to reach **$28.3 billion**, with the share of mortality costs increasing to 49 per cent.\(^4\)
- At least **80% of Canadians**, have at least one risk factor for heart disease or stroke (smoking, alcohol, physical inactivity, obesity, high blood pressure, high blood cholesterol, diabetes).\(^6\)

**Information Sources:**
1. WHO: Cardiovascular diseases (CVD) Factsheet
2. Statistics Canada: Leading causes of death, by sex 2011
3. Conference Board of Canada: The Canadian Heart Health Strategy - Risk Factors and Future Cost Implications
4. Heart and Stroke Foundation: Statistics
5. PHAC: Chronic Diseases - Cardiovascular Disease

**Diabetes**

- **387 million** people worldwide have diabetes\(^1\). It is projected that diabetes will be the 7th leading cause of death in 2030\(^2\)
- In the next 15 years, it is anticipated that the global incidence of type 2 diabetes in children will increase by up to 50 per cent.\(^3\)
- Diabetes is a contributing factor in the deaths of approximately **41,500 Canadians** each year.\(^3\) It is estimated that the number of Canadians living with diabetes will reach **3.7 million** by 2018/19.\(^4\)
- In 2010 Canada spent $11.7 billion for treatment of diabetes in and its complications \(^5\), while Ontario spent about $4.9 billion.\(^6\) By 2020, it’s estimated that diabetes will cost the Canadian healthcare system **$16.9 billion** a year.\(^3\)
- Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use can prevent or delay the onset of type 2 diabetes.\(^2\)
Cancer

- Cancer is a leading cause of death worldwide, accounting for 8.2 million deaths in 2012 \(^1\) (13% of all deaths worldwide\(^2\)). Deaths from cancer worldwide are projected to continue rising, with an estimated 13.1 million deaths by 2030.\(^1\)
- About 30% of cancer deaths are due to the five leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use, alcohol use.\(^3\)
- Tobacco use is the most important risk factor for cancer causing 20% of global cancer deaths and 70% of global lung cancer deaths.\(^1\)
- It is estimated that economic burden of cancer was $290 billion (USD) in 2010 and the projected cost in 2030 will be $458 billion (USD).\(^2\)
- About 2 in 5 Canadians will develop cancer in their lifetime (40% of women and 45% of men) and about 1 in 4 Canadians will die of cancer.\(^3\)
- An estimated 187,600 new cases of cancer and 75,500 deaths will occur in Canada in 2013. More than half of these cases (52%) will be lung, breast, colorectal and prostate cancers.\(^3\)

Information Sources:

1. The NCD Alliance: NCD Facts
2. The Global Economic Burden of Non-communicable Diseases 2011 (Bloom et al.)
3. PHAC: Canadian Cancer Statistics 2013

Chronic Respiratory Diseases

- The two most important risk factors for chronic respiratory diseases are tobacco smoke (through personal smoking and exposure to second-hand smoke) and indoor and outdoor air quality.\(^1\)
- Respiratory diseases exert a significant economic impact on the Canadian health care system. In 2007, almost 6.5% of total health care costs were related to respiratory diseases not including lung cancer such as asthma, chronic obstructive pulmonary disease (COPD) and cystic fibrosis. This accounts for nearly $5.70 billion in direct (visible) costs of health care.\(^2\)
- An estimated 64 million people have chronic obstruction pulmonary disease (COPD) worldwide in 2004.\(^3\)
- Total deaths from COPD are projected to increase by more than 30% in the next 10 years without interventions to cut risks, particularly exposure to tobacco smoke.\(^2\)
- In 2009-2010, 772,200 (4%) Canadians, aged 35 years and older, reported being diagnosed with chronic obstructive pulmonary disease (COPD).\(^4\)
Information Sources:
1 PHAC: Chronic Respiratory Diseases Factsheet
2 PHAC: Life and Breath: Respiratory Disease in Canada (2007)
3 WHO: Chronic obstructive pulmonary disease (COPD) Fact Sheet
4 PHAC: Fast facts about Chronic Obstructive Pulmonary Disease (COPD): Data compiled from the 2011 Survey on Living with Chronic Disease in Canada

Mental Illness

- People with mental disorders experience disproportionately higher rates of disability and mortality. 1
- Persons with major depression and schizophrenia have a 40% to 60% greater chance of dying prematurely than the general population, owing to physical health problems that are often left unattended (such as cancers, cardiovascular diseases, diabetes and HIV infection) and suicide. 1
- Suicide is the second most common cause of death among young people worldwide. 1
- Exposure to adversity at a young age is an established preventable risk factor for mental disorders. 1
- A recent study estimated that the cumulative global impact of mental disorders in terms of lost economic output will amount to 16.3 million (USD) between 2011 and 2030. 1
- People living in poverty with chronic physical conditions are at risk of developing mental health problems. 2
- Additional research is needed to better understand the totality of proximal and distal psychosocial and behavioral factors that contribute to chronic disease and mental health problem co-morbidity. 3

Information Sources:
1 WHO: Sixty-Sixth World Health Assembly: Comprehensive Action Plan 2013-2020
2 Canadian Mental Health Association - Ontario
3 Mapping the Pathways Linking Mental Health and Chronic Disease

Bone and Joint Diseases

- Arthritis accounts for about 60% of musculoskeletal disorders in Canada. 1
- 4.6 million – Over 4.6 million Canadian adults (one in six Canadians aged 15 years and older) report having arthritis. By 2036, this number is expected to grow to an estimated 7.5 million Canadian adults (one in five). 2
- $33 billion – The impact of arthritis on the Canadian economy in health-care costs and lost productivity is estimated to be $33 billion each year. By 2031, this number is expected to more than double to over $67 billion. 2
- Juvenile arthritis (JA) is one of the more common disorders resulting in chronic disability in children and adolescents in Canada. Approximately 61,500 Canadian children and youth have arthritis. 2
More Canadians have **died from arthritis** and related conditions than from melanoma, asthma or HIV/AIDS.  
Approximately **2 million Canadians** suffer from osteoporosis. Half of them will eventually suffer a bone fracture.  
Women are particularly at risk because their rate of osteoporosis is twice that of men. **One in four women** in Canada over the age of 50 has osteoporosis.

**Information Sources:**

1. CIHR: Arthritis Research - The Largest Subset of All Musculoskeletal Disorders
2. Arthritis Society - Facts & Figures
3. Alberta Bone and Joint Institute: Healthy Living

---

**Vision Loss and Blindness**

- **285 million** people have vision loss worldwide: 39 million are blind and 246 million have low vision.
- Globally, uncorrected refractive errors are the main cause of visual impairment. An estimated **12 million children** are visually impaired due to refractive errors; a condition easily diagnosed and corrected.
- One percent of global blindness can be attributed to diabetes. The effect of **diabetes** on the eyes is the most common cause of blindness in people age 65 years and younger and the most common cause of new blindness in North America.
- Several factors are related to vision loss, such as lifestyle, diet, smoking, and family history; seniors are the group most at risk in Canada. In Canada, someone begins to lose their eyesight **every 12 minutes**.
- The financial cost of vision loss in Canada in 2007 was estimated to be **$15.8 billion** per annum.
- **Cataracts** remain the leading cause of blindness in middle- and low-income countries.
- **75 per cent** of all vision loss can be prevented.

**Information Sources:**

1. WHO: Visual impairment and blindness Fact Sheet
2. WHO: Diabetes Fact Sheet
3. Canadian Diabetes Association
4. CNIB: Seeing Beyond Vision Loss
5. The Cost of Vision loss in Canada (Cruess et al.) 2011
6. CNIB: Facts About Vision Loss
Oral Diseases

- Worldwide, **60–90% of school children** and nearly 100% of adults have dental cavities.¹
- Severe periodontal (gum) disease, which may result in tooth loss, is found in 15–20% of middle-aged (35-44 years) adults.¹
- **Seven out of 10** Canadians will develop gum disease at some time in their lives. It is the most common dental problem.²
- Globally, about **30%** of people aged 65–74 have no natural teeth.¹
- Oral disease in children and adults is higher among poor and disadvantaged population groups.¹
- Risk factors for oral diseases include an unhealthy diet, tobacco use, harmful alcohol use and poor oral hygiene, and social determinants.¹
- Researchers are investigating the links between gum disease and the increase in severity or risk of other diseases such as **heart disease, stroke and diabetes**.³
- Women have a unique biology such as hormonal influences that may affect oral health differently than males.⁴

Information Sources:
1 WHO: Oral health Fact Sheet
2 Canadian Dental Association: Gum Disease Facts
3 CDHO: Oral Health Matters From Head to Toe
4 Ontario Dental Association: Your Oral Health

Deafness and Hearing Loss

- **360 million people** worldwide have disabling hearing loss. The majority of these people live in low- and middle-income countries.¹
- Approximately **one-third** of people over 65 years of age are affected by disabling hearing loss.¹
- Half of all cases of hearing loss can be prevented through primary prevention.¹
- One in five teenagers, aged **12 to 19 years**, have some degree of hearing loss.²
- Studies indicate that the number of Canadian adults with hearing loss may reach three million or more, as those suffering from hearing problems often under-report their condition.²
- On a per capita basis, it is estimated that the cost of deafness and hearing loss in Canada is almost **$18 billion per year**.²

Information Sources:
1 WHO: Deafness and hearing loss Fact Sheet
2 Canadian Hearing Society: Facts and Figures
Burden by Risk Factors

Underlying chronic diseases and conditions are significant health risk factors such as tobacco use and exposure, unhealthy diets, harmful use of alcohol, obesity and overweight and physical inactivity. The following provides information about prevalence, morbidity rates and financial burden of the risk factors that contribute to most chronic diseases.

**Tobacco Use**

- Tobacco kills nearly 6 million people each year. More than five million of those deaths are the result of direct tobacco use while more than 600,000 are the result of non-smokers being exposed to second-hand smoke.
- More than 37,000 Canadians die prematurely each year from tobacco use. Non-smokers can also die prematurely from second-hand smoke, and smoking nearly doubles the risk of a person having a stroke.
- Smoking is related to more than 85% of lung cancer cases in Canada. Lung cancer remains the leading cause of cancer death for both men and women.
- Total deaths from COPD are projected to increase by more than 30% in the next 10 years without interventions to cut risks, particularly exposure to tobacco smoke.
- In Canada in 2011, smoking prevalence was highest among young adults aged 25-34 and 20-24, at 23.8% and 21.5%, respectively. Nearly one third of never-smokers in grades 6-9 were classified as susceptible to smoking.
- In 2011, tobacco use was estimated to cost the province of Ontario $7.5 billion dollars in direct ($2.2 billion) and indirect ($5.3 billion) health care costs.
- Smoking prevalence is highest among upper-middle income countries.

**Information Sources:**
1. WHO: Tobacco Fact Sheet
2. WHO Global Status Report on non-communicable diseases 2014
3. Public Health Agency of Canada Fact Sheet
4. Canadian Cancer Society: Risk factors for lung cancer
5. Lung Cancer Canada
7. CCO/PHO: Recommendations for a Healthier Ontario

**Unhealthy Diets**

- An unhealthy diet is one of the major risk factors for a range of chronic diseases, including cardiovascular diseases, cancer, diabetes and other conditions linked to obesity.
- Diet is thought to be partly responsible for about 30% to 40% of all cancers.
Specific **recommendations for a healthy diet** include: eating more fruit, vegetables, legumes, nuts and grains; cutting down on salt, sugar and fats; however, diets rich in legumes, other vegetables, and coarse grains are disappearing in all regions and countries.\(^1\)\(^3\)

- Overweight and obesity are on the rise in the developing world due to the spread of readily available and cheap processed foods and the fast food culture leading to the emerging threat of a “globesity” epidemic.\(^4\)
- In Ontario, **57.4% of those aged 12 or older** have inadequate fruit and vegetable consumption; unhealthy eating is estimated to cost the province **$2.9 billion** in direct healthcare costs.\(^5\)

**Information Sources:**

1. WHO Health Topics: Diet
2. Breastcancer.org: Eating Unhealthy food
4. The Global Economic Burden of Non-Communicable Diseases 2011 (Bloom et al.)
5. CCO/PHO; Taking Action to Prevent Chronic Disease: Recommendations for a Healthier Ontario (2012)

### Harmful Use of Alcohol

- Alcohol is the world’s **third largest risk factor** for disease burden; it is the leading risk factor in the Western Pacific and the Americas and the second largest in Europe.\(^1\)\(^2\)
- The harmful use of alcohol results in **3.3 million deaths** worldwide each year; more than half of these deaths occur from cancers, CVD and liver cirrhosis.\(^1\)\(^2\)
- The **risk of cancer** increases with the amount of alcohol consumed.\(^4\)
- Adult consumption is **highest** in high-income countries.\(^2\)\(^3\)
- Alcohol is associated with many **serious social and developmental issues**, including violence, child neglect and abuse, and absenteeism in the workplace.\(^1\)
- Among Canadians **15 years and older**, the prevalence of past-year alcohol use (2010) was **78.0%**.\(^3\)

**Information Sources:**

1. WHO: Alcohol Fact Sheet
2. WHO Global Status Report on non-communicable diseases 2014
3. WHO: World Health Statistics 2011
4. PHAC: Canadian Cancer Statistics 2013
5. Health Canada: Drug and Alcohol Use Statistics

### Obesity and Overweight

- Overweight and obesity are the **fifth leading risk factors** for global deaths.\(^1\)
- In 2008, more than **1.4 billion adults**, 20 and older, were overweight. Of these over 200 million men and nearly 300 million women were obese.\(^1\)
At least **2.8 million** adults die each year as a result of being overweight or obese.  
More than **40 million children** under the age of five were overweight in 2011.

The prevalence of overweight is highest in upper-middle income countries.

**44% of the diabetes burden**, 23% of the ischaemic heart disease burden and between 7% and 41% of certain cancer burdens are attributable to overweight and obesity.

The development of **type 2 diabetes** is closely related to obesity; about 95 per cent of children with type 2 diabetes are overweight at diagnosis.

The risk of developing osteoarthritis rises with excess body weight – and the risk is **nine-fold** for obese people.

---

**Information Sources:**

1. [WHO: Obesity and overweight Fact Sheet](#)
2. [WHO: World Health Statistics 2011](#)
3. [CDA: More Canadian adolescents are being diagnosed with type 2 diabetes than ever before](#)
4. [PHAC: Diabetes in Canada: facts and figures from a public health perspective](#)
5. [Alberta Bone & Joint Institute Fact Sheet](#)

---

**Physical Inactivity**

- Approximately **3.2 million** people die each year due to physical inactivity; physical inactivity increases the risk of all-cause mortality by 20-30%.  
- Research shows that as much as half the functional decline between the ages of 30 and 70 is due not to aging itself but to an inactive way of life.
- Insufficient physical activity is highest in high-income countries.
- Physical activity has been shown to reduce the risk of **25 chronic conditions**, including coronary heart disease, stroke, hypertension, breast cancer, colon cancer, Type 2 diabetes and osteoporosis.
- Emerging research points to the significant impact of exercise and diet on positive mental health and recovery from mental illness.
- The estimated direct, indirect, and total health care costs of physical inactivity in Canadian adults in 2009 were $2.4 billion, $4.3 billion, and **$6.8 billion**, respectively. These values represented 3.8%, 3.6%, and 3.7% of the overall health care costs.
- In Canada, 6-19 year olds spend an average of **8.6 hours per day**, or 62% of their waking hours in sedentary pursuits (2007-09 CHMS).
- In 2010, only 4% of Canadian youth aged 12-17 met the Canadian Physical Activity Guidelines of 60 minutes of moderate or hard physical activity each day.
- **49.2% of Ontarians** aged 12 or older are inactive during leisure time; generally, girls, those with lower family income and parent education levels, and adolescents are less active.

---

**Information Sources:**

1. [WHO: World Health Statistics 2011](#)
2. [WHO Global Status Report on non-communicable diseases 2014](#)
3 WHO: Global Health Observatory data - Prevalence of insufficient physical activity
4 Public Health Agency of Canada Fact Sheet
5 Ontario Health Promotion E-bulletin
6 Health care costs of physical inactivity in Canadian adults
7 2011 Active Healthy Kids Canada Report Card on Physical Activity for Children and Youth - Ontario Report Card Supplement
8 Active Healthy Kids Canada: 2013 Report Card
Prevention Research is Key

The World Health Organization identified prevention research as an essential component of the approach to address chronic disease. Relevant and rigorous evidence needs to be both generated and used to prevent chronic diseases. A wide range of scientific advances are needed to inform preventive efforts (e.g., basic biological processes, dynamic system models, methodological innovations, behavioural studies, policy impact studies) with the ultimate goal of reducing the individual and societal burdens from chronic diseases.

Despite long-standing calls for more emphasis on prevention, health system allocation and political action have not followed suit. The same is true for prevention research. This is changing, however. For example, Canada has its first cancer and chronic disease prevention research framework recently released by the Canadian Cancer Research Alliance. Canada’s major NGOs (e.g., Canadian Cancer Society, Heart and Stroke Foundation) are also enhancing their emphasis on prevention research. A major theme in these calls for prevention research is contributions from multiple disciplines working together to solve health, economic and social problems. The multi-disciplinary and team foci are desired hallmarks of Waterloo’s Chronic Disease Prevention Imitative (CDPI).

What, then, are the boundaries and opportunities for chronic disease prevention research? No single framework exists for CDP research. The cancer research community is most advanced in defining prevention research, with a particular focus on cancer. The CCRA categories for cancer prevention research include: research focus (e.g., causes, interventions), risk factors (e.g., physiological susceptibilities, diet and nutrition, occupational exposures, tobacco), and research types (e.g., human research, methodological / measurement research, knowledge synthesis). The categories are relevant to all chronic diseases, while the specifics within each category would vary.

Many risk and protective factors are shared by different diseases and are widespread in the population. These represent ‘hot spots’ for prevention and is a primary niche for Waterloo’s CDPI. The Waterloo Initiative will primarily address social, behavioural, environmental, and other factors contributing to several chronic diseases.

These prevention priorities are situated within a broad scope of prevention. Those people with and without established risk factors, symptoms and disease are all eligible for prevention efforts. The full continuum of prevention includes:

- Primary prevention to reduce the likelihood of developing a disease or disorder;
- Secondary prevention to prevent or minimize the progress of a disease or disorder; and
- Tertiary prevention to halt the progression of damage already done.

Note the full continuum of research from basic to applied is needed for chronic disease. Table 2 provides some examples of valuable contributions from different disciplines, especially to address the Waterloo niche of social, behavioural, environmental, and other factors contributing to several chronic diseases.
Table 2: Examples of Chronic Disease Research at Waterloo across Disciplines

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Science</td>
<td>Study of the future impact of chronic diseases, and possible prevention</td>
</tr>
<tr>
<td></td>
<td>initiatives, on morbidity, mortality, pensions</td>
</tr>
<tr>
<td>Basic Sciences</td>
<td>Molecular and physiological aspects of nutrition and nutritional disorders</td>
</tr>
<tr>
<td></td>
<td>Designing healthy and agriculturally-accessible food sources</td>
</tr>
<tr>
<td></td>
<td>Regulation of blood glucose levels</td>
</tr>
<tr>
<td></td>
<td>Basic Biology of Diabetes and obesity</td>
</tr>
<tr>
<td></td>
<td>Environmental effects on water supply and drinking water quality</td>
</tr>
<tr>
<td></td>
<td>Ecotoxicology of water and aquatic species</td>
</tr>
<tr>
<td>Biostatistics</td>
<td>Development of methods for the design and analysis of CDP studies, both</td>
</tr>
<tr>
<td></td>
<td>randomized trials of interventions and observational studies</td>
</tr>
<tr>
<td></td>
<td>Development of methods to deal with aspects of data from CDP studies (e.g.</td>
</tr>
<tr>
<td></td>
<td>missing data, correlated responses, time dependent covariates, multi-state</td>
</tr>
<tr>
<td></td>
<td>models, multi-level data, etc.)</td>
</tr>
<tr>
<td></td>
<td>Simulation of complex systems</td>
</tr>
<tr>
<td></td>
<td>Analysis of complex data structures</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Development of systems for data capture, storage, retrieval</td>
</tr>
<tr>
<td></td>
<td>Development of software applications (e.g. smartphone apps) for monitoring</td>
</tr>
<tr>
<td></td>
<td>or intervention</td>
</tr>
<tr>
<td>Economics</td>
<td>Effects of taxation on consumption of health promoting and health inhibiting</td>
</tr>
<tr>
<td></td>
<td>products</td>
</tr>
<tr>
<td></td>
<td>Public health impacts of tax avoidance and tax evasion</td>
</tr>
<tr>
<td></td>
<td>Economic incentives for health promoting behaviours</td>
</tr>
<tr>
<td>Geography and Planning</td>
<td>Designing walkable cities</td>
</tr>
<tr>
<td></td>
<td>Evaluating access to healthy food at the local level</td>
</tr>
<tr>
<td></td>
<td>Examining the interaction between the built environment and health behaviours</td>
</tr>
<tr>
<td></td>
<td>Assessing the role of place in fostering social interaction</td>
</tr>
<tr>
<td></td>
<td>Strategic planning for the development of healthy and inclusive cities</td>
</tr>
<tr>
<td></td>
<td>Development of tools to measure physical activity patterns and engagement</td>
</tr>
<tr>
<td></td>
<td>with local environments</td>
</tr>
<tr>
<td>History</td>
<td>Analysis of social and historical roots of problems / interventions</td>
</tr>
<tr>
<td></td>
<td>Analysis of public policy history</td>
</tr>
</tbody>
</table>

Information Sources:
1 Waterloo Chronic Disease Prevention Initiative: Rationale and Overview of an Emerging Plan 2012 (unless otherwise stated)
3 Dimensions and Categories of the Cancer Risk and Prevention Cube (PDF)
University of Waterloo’s Chronic Disease Prevention Initiative (CDPI)

For full details go to: Waterloo Chronic Disease Prevention Initiative

The mission of the University of Waterloo’s Chronic Disease Prevention Initiative (CDPI) is to generate and facilitate the use of relevant and rigorously developed knowledge to advance chronic disease prevention (CDP) in Canada and around the world, through:

- Supporting multi-disciplinary programs of research;
- Mentoring the next generation of researchers whose work contributes to CDP; and
- Informing and advising funders, policy and practice leaders in health and non-health sectors, and the public about CDP research needs, findings and implications.

The Waterloo CDP Initiative focuses primarily on social, behavioural, environmental, and other factors that contribute to several chronic diseases by embracing the full continuum of prevention including reducing the likelihood of developing a disease or disorder (primary prevention), preventing or minimizing the progress of a disease or disorder (secondary prevention), and halting the progression of damage already done (tertiary prevention).

Waterloo CDPI Seed Grant Funding

For full details go to: Waterloo CDPI Seed Grant Funding

As part of the CDPI, seed grant funding is available to Waterloo applicants across disciplines. Spring and Fall funding competitions began in the Spring of 2013.

Seed Grant Objectives:

1. Bring together new teams and/or expand existing teams
2. Promote multidisciplinary collaboration at Waterloo
3. Increase the success of individuals and teams in applications for external funding with the expectation that external funding will be applied for within two years of receipt of seed funding.

Details of the Award:

- Seed grants up to a maximum of $10,000 each.
- An individual may only apply as a primary applicant on one application per competition, but may be included as a team member on other applications during the same competition period.
- The primary applicant must have a regular or definite-term faculty appointment at Waterloo.
Chronic Disease Prevention Research External Funding Sources

The following lists sources and links to external funding opportunities in chronic disease prevention research.

<table>
<thead>
<tr>
<th>Funding Source and Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Cancer Research Alliance (CCRA)</td>
</tr>
<tr>
<td>(Summary of funding sources listed)</td>
</tr>
<tr>
<td>Canadian Institute of Health Research (CIHR)</td>
</tr>
<tr>
<td>Public Health Agency of Canada (PHAC)</td>
</tr>
<tr>
<td>Canadian Cancer Society Research Institute (CCSRI)</td>
</tr>
<tr>
<td>Canada Foundation for Innovation</td>
</tr>
<tr>
<td>Ministry of Health and Long-term Care</td>
</tr>
<tr>
<td>Heart and Stroke Foundation</td>
</tr>
<tr>
<td>Social Sciences and Humanities Research Council</td>
</tr>
<tr>
<td>Ontario Ministry of Economic Development and Innovation</td>
</tr>
<tr>
<td>Ontario Trillium Foundation</td>
</tr>
<tr>
<td>Canadian Association for Dental Research</td>
</tr>
<tr>
<td>CNIB</td>
</tr>
<tr>
<td>The Foundation Fighting Blindness</td>
</tr>
<tr>
<td>National Institutes of Health</td>
</tr>
<tr>
<td>Women’s College Hospital</td>
</tr>
<tr>
<td>Thrasher Research Fund</td>
</tr>
<tr>
<td>Max Bell Foundation</td>
</tr>
</tbody>
</table>