

## **Trend 3 - CHRONIC DISEASE PREVENTION AND MANAGEMENT**

### **INTRODUCTION**

According to the World Health Organization, chronic diseases are those diseases of long duration and generally slow progression<sup>1</sup> such as cardiovascular diseases (heart disease and stroke), diabetes, arthritis, asthma, chronic obstructive pulmonary disease, and depression. Many chronic conditions can be prevented through lifestyle changes that can reduce one's risk factors.<sup>2</sup>

### **SUMMARY OF KEY FINDINGS**

#### **Growing Challenges**

- Rising prevalence and costs associated with chronic disease
- Increasing incidence of chronic disease in children and adolescents
- The burden of co-morbid chronic diseases

#### **Emerging Responses**

- There are a number of national and local prevention efforts in adults and children
- Self-management and team-based care approaches have proven successful
- Programs and interventions are beginning to address co-morbid chronic diseases

### **GROWING CHALLENGES**

#### **Rising Prevalence and Costs**

Within the last decade, the prevalence rates of numerous chronic diseases have increased significantly, both internationally and in Canada.<sup>3</sup>

<sup>4</sup> As more people suffer from chronic disease, the costs associated with these diseases also increase.<sup>5, 6</sup>

- In 2005, chronic diseases accounted for 35 million deaths worldwide, or 60% of all deaths<sup>7</sup>. This is projected to rise to 69% in 2030.<sup>8</sup>

- In 2008, 39% of Canadians reported having at least one of seven common chronic health conditions (arthritis, cancer, chronic obstructive pulmonary disease (COPD), diabetes, heart disease, high blood pressure, and mood disorders including depression)<sup>9</sup> and in 2003, almost 80% of Ontarians over age 45 – 3.7 million people – had at least one chronic condition.<sup>10</sup>
- In 2006/07, 22.7% of Canadian adults aged 20 years and older were living with diagnosed hypertension, and the true prevalence of the condition is likely higher.<sup>11</sup> The lifetime risk for developing hypertension among adults aged 55 to 65 years with normal blood pressure is 90%. Hypertension is both the most common reason to visit a doctor, and the number one reason for taking medication – over four million prescriptions for antihypertensive medication are written each month.<sup>12</sup>
- In 2003, over \$2.3 billion was spent on physician, medication and laboratory costs for hypertension.<sup>13</sup>
- Between 2002-2003 and 2006-2007, the age-standardized prevalence of diagnosed diabetes increased 21% in Canada. In 2006-2007, approximately 2 million Canadians, or about one in 16 people, had been diagnosed with diabetes. Projections indicate that by 2012, nearly 2.8 million Canadians will be living with diagnosed diabetes, representing an estimated annual percent increase of about 6% per year, with an overall increase of approximately 25% from 2007.<sup>14</sup>

- After adjusting for differences in age distributions between provinces and territories, the age-standardized prevalence of diagnosed diabetes in 2006-2007 was slightly higher in Ontario (5.6%) than the national average (5.2%).<sup>15</sup> Management of diabetes can be very expensive, and given Canada's aging demographic, it is projected that the direct health care costs associated with diabetes will total over \$8 billion annually by 2016.<sup>16</sup>
- Strokes are a main cause of both mortality (accounted for 5% of deaths in 2005) and morbidity in Canada. The costs of stroke are high as over 50% of stroke survivors require rehabilitation to regain functional skills and there is a frequent need for hospitalization.<sup>17</sup>
- A 2007 report on the economic cost of chronic disease in Canada from 1995-2003 found that it the most costly chronic diseases involves neuropsychiatric disorders with an estimated per capita cost \$1,056 or \$34 billion in direct and indirect costs in 2003. Other chronic disease with high economic impact include cardiovascular diseases - \$640 per capita in 1998, musculoskeletal disease -- \$640 per capita in 1998, and cancers - \$571 per capita in 2002. Diabetes is estimated to cost \$306 per capita in 1999, and respiratory diseases \$295 per capita in 1998.<sup>18</sup>
- In 2004, over 100 million people in the US were living with chronic diseases, and spending on hospitalizations and chronic care management exceeded up to \$500 billion per year. This represented over 75% of all health care costs at the time. More than 50% of Medicaid and Medicare beneficiaries were living with a chronic disease or disabling condition.<sup>19</sup>
- In Canada, 3 out of every 1,000, one- to 19-year-olds had diabetes in 2006-2007, and it is predicted that almost 28,000 members of this age group will be living with diabetes by 2012; an overall increase of approximately 10% from 2007.<sup>21</sup>
- A 2009 study found that, from 1994 to 2004, there was an increase of approximately 3% annually in the rate of diabetes in children of all ages in Ontario. The incidence rate overall has gone from 24.5/100,000 in 1994 to 32.3/100,000 in 2003. The study notes that most children with diabetes have Type 1, but a growing number of children are being diagnosed with Type 2 diabetes.<sup>22</sup>
- In Canada, 13% of children aged 11 and under had asthma in 2000-2001. Boys were significantly more likely than girls to have asthma, though childhood asthma is not related to income or urban/rural residence.<sup>23</sup>
- One study tracking children under 10 with asthma in Ontario found that the prevalence of childhood asthma increased by 35% between 1994 and 1998. Children with asthma had a higher healthcare utilization and cost over \$100 more per child per year than the general population, and contributed to over one third of the total OHIP expenditures.<sup>24</sup>
- In 2003, asthma was the leading cause of burden of disease in Australian children, contributing 17.4% of total disability-adjusted life years (DALYs) and the eleventh-leading contributor to the overall burden of disease in Australia, accounting for 2.4% of the total number of DALYs.<sup>25</sup>
- A recent ICES study found that the number of children living with Crohn's disease and ulcerative colitis, collectively known as Inflammatory Bowel Disease (IBD) in Ontario has increased by 50 per cent since 1994. The prevalence in under 18-year-olds has increased from 42.1 per 100,000 children in 1994 to 56.3 per 100,000 in 2005. The study concluded that Ontario has one of the highest rates of pediatric IBD in the world.<sup>26</sup>

### **Chronic Disease Among Children and Adolescents**

- Diabetes mellitus is one of the leading chronic diseases of childhood and youth; in the US it affects 1.82 out of every 1,000 young people. Moreover 92% of youth with type 2 diabetes have two or more cardiovascular disease risk factors in addition to diabetes.<sup>20</sup>

### Co-morbidities

- Of those Ontarians over 45 with one chronic disease, 70%, or 2.6 million Ontarians, had multiple conditions.<sup>27</sup> The presence of multiple chronic diseases makes treatment plans more complex and often requires care from numerous providers and specialists.<sup>28</sup>
- In the UK, 15% of people with three or more chronic conditions account for almost 30% of inpatient hospital days.<sup>29</sup>
- The 2004-2005 National Health Survey reported that almost all Australians 65 years old or over had at least one chronic condition, with over 80% having at least three chronic conditions.<sup>30</sup>
- Comorbidity is associated with a decline in many health outcomes and increases in mortality and use of health care resources. An Australian review found that over half of the elderly patients with arthritis also had hypertension, 20% had cardiovascular disease (CVD), 14% diabetes and 12% mental health problem. Over 60% of patients with asthma reported arthritis as a co-morbidity, 20% also had CVD and 16% diabetes. Of those with CVD, 60% also had arthritis, 20% diabetes and 10% had asthma or mental health problems.<sup>31</sup>
- Recent data highlight the link between diabetes and cardiovascular disease. Compared to non-diabetic Canadians, adult diabetics are hospitalized almost four times more often for heart failure and about three times more frequently for ischemic heart failure, heart attack and stroke.<sup>32</sup> In 2006-2007, 62.8% of adults (aged 20 years and older) with diabetes also had hypertension, such that 5.1% of Canadian adults were living with both conditions.<sup>33</sup>
- Depression is a commonly comorbid with chronic conditions and recent research suggests it tends to worsen outcomes. One in three heart attack survivors and 20% of those with ischemic heart disease or stroke suffer from clinical depression. Depression can also retard the process of returning to daily life and self-care among stroke survivors, increase odds of re-hospitalization and death among heart disease patients,

and increase the odds of developing ischemic heart disease in diabetics.<sup>34</sup>

- A 2007 study challenged the idea of an 'all or nothing' relationship between depression and high risk for non-adherence to diabetes care. Instead, the authors noted a continuous relationship between depression and non-adherence to diabetes self-care, evident by symptoms at sub-clinical levels. Major depression was significantly associated with poorer diabetes self-care behaviours, specifically lower adherence to: general diet, consumption of fruits and vegetables, spacing carbohydrates, exercise recommendations, glucose monitoring and prescribed medications.<sup>35</sup>

## EMERGING RESPONSES

### Prevention Efforts in Adults and Children

- The Canadian Heart Health Initiative is a multilevel strategy, linking national, provincial and local health departments. It combines research with the implementation of community-based heart health programs. The Initiative has created extensive intersectoral partnerships and networks as a means of developing and disseminating prevention knowledge and its efforts are directed primarily at the general population and concentrate on achieving environmental changes supportive of "heart-healthy" habits and lifestyles.<sup>36</sup>
- The EUROACTION study examined the impact of a nurse-coordinated, multidisciplinary, family-based, preventative cardiology program delivered to those at the highest risk of developing cardiovascular disease. Those who received the intervention were more likely to quit smoking, reduce consumption of saturated fat, increase consumption of fruits and vegetables, and experience a greater decline in total cholesterol within 1 year than those receiving usual care.<sup>37</sup>
- In 2010, the Sodium Working Group released a sodium reduction strategy for Canada which sets out recommendations aimed at achieving an interim goal of reducing the population mean daily intake of sodium from the current mean – 3,400 mg –

to 2,300 mg by 2016; the ultimate goal is to lower sodium intakes to a population mean whereby greater than 95% of the population have a daily intake below 2,300 mg.<sup>38</sup> The strategy sets out six overarching recommendations, as well as 27 specific recommendations in four areas: food supply, awareness and education, research, and monitoring and evaluation.<sup>39</sup>

- In 2005, British Columbia launched ActNow BC, a cross-government health promotion initiative seeking to improve the health of British Columbians by taking steps to address common risk factors and reduce chronic disease. The provincial program supports schools, employers, local governments and communities to develop and promote programs that ease British Columbians' healthy choices. The program set five goals relating to physical activity, healthy eating, obesity, tobacco use and health during pregnancy.<sup>40</sup> A case study of the program by the World Health Organization found that the integrating mechanisms and strategies initiated and adopted as part of ActNow BC were "promising best practices" that can inform other jurisdictions in the development of similar whole-of-government initiatives.<sup>41</sup>
- The US Patient Protection and Affordable Care Act, signed into law in 2010, targets chronic disease in several ways.<sup>42</sup>
  - The act establishes the National Prevention, Health Promotions and Public Health Council, which will provide recommendations to achieve national wellness, health promotion, and public health goals and consider and propose evidence-based models, policies, and innovative approaches for prevention, integrative health, and public health across the US.
  - An advisory group will develop policy and program recommendations and advise on lifestyle-based chronic disease prevention and management, integrative health care practices, and health promotion.
  - A Prevention and Public Health Fund will be established to provide for expanded and sustained national
- investment in prevention and public health programs to improve health and help restrain the rate of growth in private and public sector health care costs. Funding was set at \$500 million for 2010, and is scheduled to increase year-over-year until it reaches \$2 billion in 2015, and thereafter.<sup>43</sup>
- The American Association of Retired Persons (AARP) is a nonprofit organization for people over 50 dedicated to enhancing quality of life by providing information, advocacy and services.<sup>44</sup> Along with the AHRQ, the AARP has created two new checklists that outline the steps men and women over age 50 need to take to stay healthy and prevent disease.<sup>45</sup> The checklists outline daily steps to health (such as being tobacco free, eating a healthy diet), what preventive medicines should be considered (aspirin, immunizations), and what screening tests are needed and when (e.g., for Abdominal Aortic Aneurysm, colorectal cancer, diabetes).<sup>46</sup>
- The Diabetes Prevention Program (DPP) in the US is a successful preventative program for individuals with pre-diabetic conditions. The DPP is a lifestyle-modification program with the goals of at least a seven percent weight loss and at least 150 minutes of physical activity per week for enrollees.<sup>47</sup> In randomized controlled trials, weight loss achievements have ranged from six to seven percent for 45-50% of participants.<sup>48,49,50</sup> Similar diabetes programs have also been studied in China<sup>51</sup> and Finland<sup>52</sup> with comparable outcomes.
- The American Diabetes Association has launched My Health Advisor, an online tool that helps people understand their personal risk for developing type 2 diabetes, heart disease and stroke. My Health Advisor takes into account a person's specific risk factors, such as family history and lifestyle choices, as well as other factors like access to health care, to determine their risk for developing diabetes, heart disease and stroke. To encourage preventative measures, the online calculator immediately reflects and readjusts a person's risk

outcome based on small changes they make in their lives, such as losing 5-10 pounds, quitting smoking or taking a daily aspirin.<sup>53</sup>

- In the US, the NIH-funded HEALTHY study is currently being conducted in 42 middle schools to determine if changes in school cafeterias, vending machines, and physical education classes, along with activities that encourage healthy behaviors, can lower risk factors for type 2 diabetes in youth.<sup>54</sup>
- The Smoke-Free Ontario Amendment Act 2008 came into effect in January 2009 and makes smoking in any motor vehicle illegal when passengers under the age of 16 are present.<sup>55</sup> This and other anti-smoking efforts might help the development of childhood asthma, as parental second-hand smoke is a risk factor for the disease<sup>56</sup>, and exposure to cigarette smoke in cars doubles the risk of developing asthma.<sup>57</sup>

#### **Self-Management and Provision of Education**

- Ontario has developed a framework for the prevention and management of chronic disease, which identifies a cluster of practice and system changes that have been found to improve chronic care delivery. These elements – which include personal skills and self-management support as well as delivery system design, provider decision support, and information systems – have been applied successfully in many jurisdictions.<sup>58</sup>
- A randomized control trial in the UK examined the effectiveness of diabetes education on improving outcomes amongst newly diagnosed type 2 diabetics. As compared to the control group, individuals who received a 6-hour group educational program from health care professional educators lost more weight, maintained this lower weight, experienced a greater decline in Hemoglobin A1C, had a greater understanding of diabetes and were less likely to be depressed during the 12-month follow-up period.<sup>59</sup>
- The Expert Patients Programme (EPP) is a skills training program to help develop patients' self-care skills, confidence and motivation to take more effective control over their long-term conditions. A central element of chronic disease management policy in the

United Kingdom, a national randomized controlled trial found the program to be effective in improving self-efficacy and energy levels among patients with long-term conditions, and reductions in service use (especially expensive inpatient stays) offset the costs of providing the self-management skills course.<sup>60</sup>

- A recent Ontario study of a web-based diabetes tracker found those who had access to it experienced greater declines in systolic and diastolic blood pressure and glycated hemoglobin after 6 months than those in usual care. The tracker, which can be accessed by both the patient and a primary care provider, provides sequential monitoring values for 13 diabetes risk factors, their respective targets and brief, prioritized messages of advice.<sup>61</sup>
- A US study found that a tailored hypertension self-management intervention delivered by a nurse over the telephone had a modest effect on blood pressure control, but also had unintended positive effects on glycemic control. Patients with diabetes who received the intervention for blood pressure also had significant improvements in their HbA1c.<sup>62</sup>

#### **Team-Based Care**

- A recent review of chronic care treatment models concludes that integration of service delivery is key to chronic disease care and there is strong evidence that multidisciplinary teams providing care for chronic disease patients improve patient satisfaction, reduce health-care resource use and have a minimal impact on quality of care and clinical outcomes.<sup>63</sup>
- In Ontario, the Ministry of Health and Long-Term Care has created 170 Family Health Teams in various Local Health Integration Networks (LHINs), with an additional 30 teams announced in August, 2010.<sup>64</sup> These teams are composed of doctors, nurses, nurse practitioners, and other health care professions who will work together to provide more coordinated health care and improved management of chronic diseases.<sup>65</sup>

- To help Ontario Family Health Teams learn and adopt quality improvement techniques in their practices, the Quality Improvement and Innovation Partnership (QIIP) has been established. QIIP recently launched *Learning Communities*, a quality improvement program supporting primary care providers; the first wave of the program focused on six areas: diabetes, asthma, hypertension, chronic obstructive pulmonary disease, integrated cancer care and office practice redesign.
- A randomized control trial in 14 community pharmacies in Alberta, Canada, found that even in patients who have diabetes and hypertension that are relatively well controlled; a pharmacist and nurse team-based intervention resulted in a clinically important improvement in blood pressure.<sup>66</sup>
- The Health Council of Canada examined five case studies of effective team-based primary health care for chronic disease and found that key ingredients for success include: effective leadership, clear roles and responsibilities for team members, an electronic health/medical record system; and patient-centred programs and support services, combined with effective (usually electronic) self-assessment and self-management tools.<sup>67</sup>
- In Finland, a successful team-based approach to chronic disease management involves primary health teams usually made up of five family physicians and five nurses. The approach includes annual health assessments of patients, quality assessments of primary health teams, and an emphasis on self-management. Financial incentives are also offered to providers who meet specific targets and goals relating to a patient's management of the chronic disease.<sup>68</sup>

#### **Addressing Co-morbidities**

- A US study indicates patients with several chronic conditions use fewer health care resources and cost less when they are closely supported by a nurse-physician primary care team that tracks their health and offers regular support. The research found that in the first eight months of a

randomized controlled trial, patients in a primary care enhancement program called "Guided Care" had 24% fewer hospital days, 37% fewer skilled nursing facility days, 15% fewer emergency department visits and 29% fewer home health care episodes.<sup>69</sup>

- The CDC Arthritis Program is using two different approaches to address the needs of people with arthritis as well as another chronic condition. The CDC has provided states with more funds to extend effective, evidence-based interventions, such as implementing and disseminating arthritis-specific physical activity and self management education programs, the Chronic Disease Self-Management Program (CDSMP), and EnhanceFitness, a multi-component physical activity program appropriate for people with chronic conditions.<sup>70</sup>
- A recent systematic review found that although the number of studies in this area is small, antidepressants appear to be effective for treating depression and/or anxiety in patients with heart disease, stroke, cancer and arthritis, and a range of psychological and behavioural treatments are also effective in improving mood in patients with cancer and arthritis.<sup>71</sup>
- Although more controlled trials clearly are needed, existing studies suggest that depression in patients with neurological disorders (such as Alzheimer disease, stroke, Parkinson disease, and multiple sclerosis) responds to antidepressant medication and, in some disorders, to psychotherapeutic approaches.<sup>72</sup>
- A 16-week psychotherapy trial in patients with multiple sclerosis (MS) and depression compared telephone-administered cognitive behavior therapy (CBT) with telephone-administered supportive emotion-focused therapy (SEFT); the results showed significant improvements from baseline in depression and concomitant decrease in disability and fatigue for both interventions. Compared with SEFT, CBT was associated with significantly greater reductions in disability and fatigue even after controlling for reduction in depression, suggesting additional benefits of CBT for patients with

MS Independent of its effects on depression.<sup>73</sup>

- A recent study on a coordinated disease management program for Medicaid patients with one or more chronic diseases found the program was effective in managing comorbidities, reducing adverse drug events and the use of medical care and drugs. The

three-year study involved mailing participating physicians and pharmacists educational materials updated state-of-the-art practice guidelines, feedback sheets, and clinical summaries and having them consult with their patients about their lifestyles, treatments and drug uses.<sup>74</sup>

## REFERENCES

<sup>1</sup> World Health Organization. (2008). *Preventing Chronic Diseases a vital investment*. Accessed October 2010 at: [http://www.who.int/chp/chronic\\_disease\\_report/full\\_report.pdf](http://www.who.int/chp/chronic_disease_report/full_report.pdf)

<sup>2</sup> *Ibid.*

<sup>3</sup> *Ibid.*

<sup>4</sup> Public Health Agency of Canada (2009). Diabetes policy review - report of the expert panel. Accessed October 2010 at: <http://www.phac-aspc.gc.ca/publicat/2009/dprrep-epdrge/index-eng.php>

<sup>5</sup> *Ibid.*

<sup>6</sup> Paez, K. A., Zhao, L. & Hwang, W. (2009). Rising out-of-pocket spending for chronic conditions: A ten-year trend. *Health Affairs*, 28(1): 15-25.

<sup>7</sup> *Ibid.*

<sup>8</sup> Scheller-Kreinsen D, Blümel M, Busse R. (2009). Chronic disease management in Europe. *Eurohealth* 15(1), 1-4.

<sup>9</sup> Health Council of Canada (2010). *Helping Patients Help Themselves: Are Canadians with Chronic Conditions Getting the Support They Need to Manage Their Health?* Accessed October 2010 at: [http://www.healthcouncilcanada.ca/docs/rpts/2010/AR1\\_HCC\\_Jan2010.pdf](http://www.healthcouncilcanada.ca/docs/rpts/2010/AR1_HCC_Jan2010.pdf)

<sup>10</sup> Ontario Ministry of Health and Long-Term Care (2007). *Preventing and Managing Chronic Disease: Ontario's Framework*. Accessed October 2010 at: [http://www.health.gov.on.ca/english/providers/program/cdpm/pdf/framework\\_full.pdf](http://www.health.gov.on.ca/english/providers/program/cdpm/pdf/framework_full.pdf)

<sup>11</sup> Public Health Agency of Canada Website. Hypertension Facts and Figures. Accessed October 2010 at: [http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension\\_figures-eng.php](http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension_figures-eng.php)

<sup>12</sup> *Ibid.*

<sup>13</sup> *Ibid.*

<sup>14</sup> Public Health Agency of Canada (2009). Report from the National Diabetes Surveillance System: Diabetes in Canada, 2009. Ottawa, Canada. Accessed September 2010 at: <http://www.phac-aspc.gc.ca/publicat/2009/ndssdic-snsddac-09/pdf/report-2009-eng.pdf>

<sup>15</sup> Public Health Agency of Canada (2009). Report from the National Diabetes Surveillance System: Diabetes in Canada, 2009. Ottawa, Canada. Accessed September 2010 at: <http://www.phac-aspc.gc.ca/publicat/2009/ndssdic-snsddac-09/pdf/report-2009-eng.pdf> (*Ibid.*?)

<sup>16</sup> Ohinmaa, A., Jacobs, P., Simpson, S., Johnson, J. A. (2004). The projection of prevalence and cost of diabetes in Canada: 2000 to 2016. *Canadian Journal of Diabetes*, 28(2), 1-8.

<sup>17</sup> Public Health Agency of Canada. (2009). Tracking Heart Disease & Stroke in Canada. Accessed October 2010 at: <http://www.phac-aspc.gc.ca/publicat/2009/cvd-avc/pdf/cvd-avs-2009-eng.pdf>

<sup>18</sup> Patra, J., Popova, S., Rehm, J., Bondy, S., Flint, R. & Giesbrecht, N. (2007). *Economic Cost of Chronic Disease in Canada 1995-2003*. Accessed October 2010 at: [http://www.ocdpa.on.ca/OCDPA/docs/OCDPA\\_EconomicCosts.pdf](http://www.ocdpa.on.ca/OCDPA/docs/OCDPA_EconomicCosts.pdf)

<sup>19</sup> Deloitte Center for Health Solutions (2008). *Connected Care: Technology-Enabled Care at Home*. Accessed October 2008 at:

[http://public.deloitte.com/media/0285/us\\_chs\\_ConnectedCare\\_0308.pdf](http://public.deloitte.com/media/0285/us_chs_ConnectedCare_0308.pdf)

<sup>20</sup> Mayer-Davis, E. (2008). Type 2 diabetes in youth: Epidemiology and current research toward prevention and treatment. *Journal of the American Dietetic Association*, 108, S45-S51.

<sup>21</sup> Public Health Agency of Canada (2009). Report from the National Diabetes Surveillance System: Diabetes in Canada, 2009. Ottawa, Canada. Accessed September 2010 at: <http://www.phac-aspc.gc.ca/publicat/2009/ndssdic-snsddac-09/pdf/report-2009-eng.pdf>

<sup>22</sup> Guttman, A., Nakhla, M., Henderson, M., To, T., Daneman, D., Cauch-Dudek, K., Wang, X., Lam, K. & Hux, J. (2010). Validation of a health administrative data algorithm for assessing the epidemiology of diabetes in Canadian children. *Pediatric Diabetes*, 11(2), 122-128. .

<sup>23</sup> Garner, G., & Kohen, D. (2008). Changes in the prevalence of asthma among Canadian children. *Health Reports*, 19(2), 45-50.

<sup>24</sup> To, T., Dell, S., Dick, P., & Cicutto, L. (2008). The Burden of Illness Experienced by Young Children Associated with Asthma: A Population-Based Cohort Study. *Journal of Asthma*, 45, 45-49.

<sup>25</sup> Australian Institute of Health and Welfare: Australian Centre for Asthma Monitoring. (2009). Burden of disease due to asthma in Australia 2003. Cat. no. ACM 16. Canberra: AIHW. Accessed October 2010 at: <http://www.aihw.gov.au/publications/acm/acm-16-10749/acm-16-10749.pdf>

<sup>26</sup> Benchimol, E., Guttman, A., Griffiths, A., Rabeneck, L., Mack, D., Brill, H., Howard, J., Guan, J. & To, T. (2009). Increasing incidence of paediatric inflammatory bowel disease in Ontario, Canada: Evidence from health administrative data. *Gut*, 58(11), 1490-1497.

<sup>27</sup> Ontario Ministry of Health and Long-Term Care. (2007). Preventing and Managing Chronic Disease. Ontario, Canada.

<sup>28</sup> Tsisis, P. & Baines, J. (2008). Management of complex chronic disease: Facing the challenges in the Canadian health-care system. *Royal Society of Medicine Press*, 21: 228-235.

<sup>29</sup> Department of Health (2004). Improving chronic disease management. London. Accessed October 2010 at:

[http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@en/documents/digitalasset/dh\\_4075213.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4075213.pdf)

<sup>30</sup> Caughey, G. E., Vitry, A. I., Gilbert, A. L., Roughead, E. E. (2008). Prevalence of comorbidity of chronic diseases in Australia. *BMC Public Health*, 27(8), 221.

<sup>31</sup> *Ibid.*

<sup>32</sup> Public Health Agency of Canada (2009). Report from the National Diabetes Surveillance System: Diabetes in Canada, 2009. Ottawa, Canada. Accessed September 2010 at: <http://www.phac-aspc.gc.ca/publicat/2009/ndssdic-snsddac-09/pdf/report-2009-eng.pdf>

<sup>33</sup> Public Health Agency of Canada (2010). Report of from the Canadian Chronic Disease Surveillance System: Hypertension in Canada, 2010. Ottawa, Canada. Accessed September 2010 at: <http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/ccdss-snsmc-2010/index-eng.php>

<sup>34</sup> Public Health Agency of Canada. (2009). Tracking Heart Disease & Stroke in Canada. Accessed October 2010 at: <http://www.phac-aspc.gc.ca/publicat/2009/cvd-avc/pdf/cvd-avs-2009-eng.pdf>

<sup>35</sup> Gonzalez, J. S., Safren, S. A., Cagliero, E., Wexler, D. J., Delahanty, L., Wittenberg, E., Blais, M. A., Meigs, J. B. & Grant, R. W. (2007). Depression, selfcare, and medication adherence in type 2 diabetes: Relationships across the full range of symptom severity. *DiabetesCare*. 30(9), 2222-2227.

<sup>36</sup> Canadian Heart Health Initiative (CHHI). Accessed October 2010 at: <http://www.med.mun.ca/chhdbc/chhimore.htm>

<sup>37</sup> Wood, D. A., Kotseva, K., Connolly, S., Jennings, C., Mead, A., Jones, J., et al. (2008). Nurse-coordinated multidisciplinary, family-based cardiovascular disease prevention programme (EUROACTION) for patients with coronary heart disease and asymptomatic individuals at high risk of cardiovascular disease: a paired, cluster-randomised controlled trial. *The Lancet*, 371,1999-2012.

---

<sup>38</sup> The Sodium Working Group (2010). Sodium Reduction Strategy for Canada: Recommendations of the Sodium Working Group. Accessed October 2010 at: [http://www.hc-sc.gc.ca/fn-an/alt\\_formats/pdf/nutrition/sodium/strateg/index-eng.pdf](http://www.hc-sc.gc.ca/fn-an/alt_formats/pdf/nutrition/sodium/strateg/index-eng.pdf)

<sup>39</sup> The Sodium Working Group (2010). Sodium Reduction Strategy for Canada: Recommendations of the Sodium Working Group. Accessed October 2010 at: [http://www.hc-sc.gc.ca/fn-an/alt\\_formats/pdf/nutrition/sodium/strateg/index-eng.pdf](http://www.hc-sc.gc.ca/fn-an/alt_formats/pdf/nutrition/sodium/strateg/index-eng.pdf)

<sup>40</sup> Ministry of Health, British Columbia (2006). About ActNow BC. Accessed October 2010 at: [http://www2.news.gov.bc.ca/news\\_releases\\_2005-2009/2006HEALTH0017-000253-Attachment1.htm](http://www2.news.gov.bc.ca/news_releases_2005-2009/2006HEALTH0017-000253-Attachment1.htm)

<sup>41</sup> WHO Collaborating Centre on Chronic Non Communicable Disease Policy (2009). Mobilizing Intersectoral Action to Promote Health: The Case of ActNowBC in British Columbia, Canada. Accessed October 2010 at: [http://www.bchealthyliving.ca/sites/all/files/WHO\\_PHA\\_C\\_ActNowBC\\_anbc\\_eng.pdf](http://www.bchealthyliving.ca/sites/all/files/WHO_PHA_C_ActNowBC_anbc_eng.pdf)

<sup>43</sup> The Patient Protection and Affordable Care Act of 2010, Pub. L. No. 111-148, § 4001-4002, 124 Stat. 539-541 (2010). Accessed October 2010 at: <http://www.gpo.gov/fdsys/pkg/PLAW-111publ148/pdf/PLAW-111publ148.pdf>

<sup>44</sup> AARP.org. *About AARP*. Accessed October 2010 at: <http://www.aarp.org/about-aarp/>

<sup>45</sup> AHRQ.gov. *AHRQ and AARP Team to Help Adults Over 50 Stay Healthy*. AHRQ website. Accessed October 2010 at: <http://www.ahrq.gov/news/press/pr2008/ppip50pr.htm>

<sup>46</sup> AARP.org. *Health Checklists for 50+ Men and Women*. Accessed October 2010 at: [http://www.aarp.org/health/conditions-treatments/info-07-2010/health\\_checklists.html](http://www.aarp.org/health/conditions-treatments/info-07-2010/health_checklists.html)

<sup>47</sup> Knowler, W., Barrett-Conner, E., Fowler, S., Hamman, R., Lachin, J., Walker, E. & Nathan, D. (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine*. 346, 393-403.

<sup>48</sup> *Ibid.*

---

<sup>49</sup> Ackermann, R. & Marrero, D. (2007). Adapting the Diabetes Prevention Program lifestyle intervention for delivery in the community: The YMCA model. *The Diabetes Educator*, 33, 69-78.

<sup>50</sup> Admundson, H., Butcher, M., Gohdes, D., Hall, T., Harwell, T., Helgeson, S., Vanderwood, K. (2009). Translating the Diabetes Prevention Program into practice in the general community: Findings from the Montana Cardiovascular Disease and Diabetes Prevention Program. *Diabetes Educator*, 35, 209-223.

<sup>51</sup> Pan, X.-P., Li, G.-W., Hu, Y.-H., Wang, W. Y., Yang, W. Y., et al. (1997). Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and diabetes study. *Diabetes Care*, 20(4), 537-544.

<sup>52</sup> Eriksson, J., Lindstrom, J., Valle, T., et al. (1999). Prevention of type II diabetes in subjects with impaired glucose tolerance: the diabetes prevention study (DPS) in Finland. Study design and 1-year interim report on the feasibility of the lifestyle intervention programme. *Diabetologia*, 42, 793-801.

<sup>53</sup> American Diabetes Association website 2009. Accessed October 2010 at: <http://www.diabetes.org/diabetes-basics/prevention/my-health-advisor/>

<sup>54</sup> Mayer-Davis, E. (2008). Type 2 diabetes in youth: Epidemiology and current research toward prevention and treatment. *Journal of the American Dietetic Association*, 108, S45-S51.

<sup>55</sup> Ireland, J. (2009). Ontario law banning smoking when child's in car starts Wednesday Canwest News Service. *The National Post*, Wednesday, January 21, 2009.

<sup>56</sup> Garner, G., & Kohen, D. (2008). Changes in the prevalence of asthma among Canadian children. *Health Reports*, 19(2).

<sup>57</sup> Sly, P. D., Deverell, M., Kusel, M. M., Holt, P. G. (2007). Exposure to environmental tobacco smoke in cars increases the risk of persistent wheeze in adolescents. *Medical Journal of Australia*, 186 (6), 322.

<sup>58</sup> Ontario Ministry of Health and Long-Term Care. (2007). Preventing and Managing Chronic Disease. Ontario, Canada.

---

<sup>59</sup> Davies, M. J., Heller, S., Skinner, T. C., Campbell, M. J., Carey, M. E., Craddock, S., et al. (2008).

Effectiveness of the diabetes education and self management for ongoing and newly diagnosed (DESMOND) programme for people with newly diagnosed type 2 diabetes. *BMJ*, *336*, 491-495.

<sup>60</sup> Rogers, A., Kennedy, A., Bower, P., Gardner, C., Gately, C., Lee, V., Reeves, D., & Richardson, G. (2008). The United Kingdom Expert Patients Programme: results and implications from a national evaluation. *MJA*, *189*(10 Suppl), S21-S24.

<sup>61</sup> Holbrook, A., Thabane, L., Keshavjee, K., Dolovich, L., Bernstein, B., Chan, D., Troyan, S., et al. (2009). Individualized electronic decision support and reminders to improve diabetes care in the community: COMPLETE II randomized trial. *CMAJ*, *181*, 37-44.

<sup>62</sup> Powers, B. J., Olsen, M. K., Oddone, E. Z., Bosworth, H. B. (2009). The effect of a hypertension self-management intervention on diabetes and cholesterol control. *The American Journal of Medicine*, *122*, 639-646

<sup>63</sup> Tsisis, P. & Baines, J. (2008). Management of complex chronic disease: facing the challenges in the Canadian health-care system. *Royal Society of Medicine Press*, *21*, 228-235.

<sup>64</sup> Ministry of Health and Long-Term Care. Family Health Teams. Accessed October 2010 at: [http://www.health.gov.on.ca/transformation/fht/fht\\_mn.html](http://www.health.gov.on.ca/transformation/fht/fht_mn.html)

<sup>65</sup> Ministry of Health and Long-Term Care. Q & A: Understanding Family Health Teams. Accessed October 2010 at: [http://www.health.gov.on.ca/transformation/fht/fht\\_understanding.html](http://www.health.gov.on.ca/transformation/fht/fht_understanding.html)

<sup>66</sup> McLean, D. L., McAlister, F. A., Johnson, J. A., King, K. M., Makowsky, M. J., Jones, C. A., Tsuyuki, R. T., & SCRIP-HTN Investigators (2008). A randomized trial of the effect of community pharmacist and nurse care on improving blood pressure management in patients with diabetes mellitus: Study of cardiovascular risk intervention by pharmacists-hypertension. *Archives of Internal Medicine*, *168*(21): 2355-2361.

<sup>67</sup> Health Council of Canada. (2009). Getting it Right: Case Studies of Effective Management of Chronic Disease Using Primary Health Care Teams. Toronto: Health Council. Accessed October 2010 at:

---

[http://www.healthcouncilcanada.ca/docs/rpts/2009/CaseStudies\\_FINAL.pdf](http://www.healthcouncilcanada.ca/docs/rpts/2009/CaseStudies_FINAL.pdf).

<sup>68</sup> *Ibid.*

<sup>69</sup> Leff, B., Reider, L., Frick, K. D., Scharfstein, D. O., Boyd, C. M., Frey, K., et al. (2009). Guided care and the cost of complex Healthcare: A preliminary report. *American Journal of Managed Care*, *15*(8), 555-559.

<sup>70</sup> U.S. Department of Health and Human Services. (2009). U.S. Department of Health and Human Services (HHS) Inventory of Programs, Activities and Initiatives Focused on Improving the Health of Individuals with Multiple Chronic Conditions (MCC). Accessed October 2010 at: [http://www.hhs.gov/ash/initiatives/mcc/mcc\\_inventory.pdf](http://www.hhs.gov/ash/initiatives/mcc/mcc_inventory.pdf)

<sup>71</sup> Clarke, D. M. & Currie, K. C. (2009). Depression, anxiety and their relationship with chronic diseases: A review of the epidemiology, risk and treatment evidence. *MJA*, *190*(7), S54-60.

<sup>72</sup> Raskind, M. A. (2008). Diagnosis and treatment of depression comorbid with neurologic disorders. *The American Journal of Medicine*, *121*(11), Supplement 2, S28-S37.

<sup>73</sup> Mohr, D. C., Hart, S., & Vella, L. (2007). Reduction in disability in a randomized controlled trial of telephone-administered cognitive-behavioral therapy. *Health Psychology*, *26*, 554-563.

<sup>74</sup> Zhang, N. J., Wan, T. T. H., Rossiter, L. F., Murawski, M. M., & Patel, U. B. (2008). Evaluation of chronic disease management on outcomes and cost of care for Medicaid beneficiaries. *Health Policy*, *86*, 345-354.