Externally-Informed Annual Health Systems Trends Report – Third Edition
Trend Backgrounder

Trend 7 – PUBLIC AND POPULATION HEALTH

INTRODUCTION

The Public Health Agency of Canada (PHAC) defines a population health approach as a strategy that aims to improve the health of the entire population and to reduce health inequities among population groups.[1] Population health builds on a tradition of public health and health promotion. It has been known for decades that changes in lifestyles or social and physical environments will likely lead to more improvements in health than would be achieved by spending more money on existing health care delivery systems.[2] Despite the medical miracles of vaccinations and disease cures, infectious diseases, as part of public health, is a topic that continues to be relevant in Canada and globally.

SUMMARY OF KEY FINDINGS

Growing Challenges:

- Increasing rates of preventable lifestyle associated diseases.
- A rise in infectious diseases among vulnerable populations and the development of drug resistance in microbes.
- The introduction of new environmental stresses and disease vectors as a result of climate change.

Emerging Responses:

- There are various health promotion initiatives aimed at helping individuals and society make healthier lifestyle choices. The internet is one tool that is becoming more widely used to deliver health promotion programs.
- Organizations and programs aimed at researching and monitoring infectious diseases have been established nationally and internationally.
- The role of climate change on human health is currently being investigated to determine potential impacts.

GROWING CHALLENGES

Lifestyle-Associated Diseases

Health Concerns Due to Obesity:

- An overweight person is classified as having a Body Mass Index (BMI) between 25 and 30, and an obese person is classified as having a BMI over 30.[3] Rises in obesity rate have occurred in the US, Europe, and other developed nations[4] due to a lifestyle shift that promotes sedentary activity.[5]
- In 2009, 33.7% of Canadians 18 years and older were overweight, and close to 18% were obese, while nearly 20% of youth aged 12 to 17 years old were overweight or obese.[6] In Ontario, direct and indirect costs associated with overweight and obesity total between $2.2 billion and $2.5 billion per year.[7]
- In England, 67% of men and 56% of women were either overweight or obese in 2006. The prevalence of obesity in England increased from 13% in men and 16% in women to 24% in both men and women between 1993 and 2006.[8]
- In the US, 133 million, or 66% of the adult population, are either overweight or obese. The prevalence of obesity has doubled since the 1960s, to an all-time high of 30 percent, and the rate of increase continues to trend up.[9] A recent Center for Disease Control and Prevention (CDC) report states that direct spending on obesity related medical care costs may be as high as $147 billion annually in the US.[10]

- A 2008 systematic review reports that increased BMI is associated with an increased risk of several cancers in adults. The magnitudes of associations between increased BMI and cancer were similar across populations for most cancer sites. However, the association was particularly strong for breast cancer in Asia–Pacific populations.[11]
- In a Swedish study that examined the health effects of obesity and smoking among male adolescents, being overweight was as hazardous as smoking 1-10 cigarettes a day, while obesity was as hazardous as smoking >10 cigarettes a day. Regardless of smoking status, overweight and obesity in late adolescence increases the risk of adult mortality.[12]
- Obesity can also have serious health consequences such as an association with type 2 diabetes mellitus[13] and asthma.[14]

Health Concerns Due to Smoking:

- Tobacco use is the leading cause of preventable death, and is estimated to kill more than five million people each year worldwide. The World Health Organization estimates that if current trends persist, tobacco will kill more than eight million people worldwide each year by the year 2030, with 80% of these premature deaths in low- and middle-income countries.[15] Tobacco use is the number one cause of preventable disease and death in Ontario, killing over 13,000 Ontarians every year. Tobacco-related diseases cost the Ontario economy $1.6 billion in direct health care costs annually, resulting in $4.4 billion in productivity losses and accounting for at least 500,000 hospital days each year.[16]
- In general, smoking rates have declined in most developing countries including Canada,[17] the UK,[18] and Denmark.[19] The US is one exception, as a slight increase in smoking rates (from 19.7% to 20.9%) was noted in 2008. This may be attributable to the current economic recession as people who had previously quit have relapsed due to stress.[20] However, despite the decreases in smoking rates, smoking is still a major contributor to illness and the latent period between smoking and disease outcomes means that smoking-attributable mortality may not always reflect recent declines in usage.[21]
- Tobacco exposure is an associated cause of lung cancer[22, 23, 24] and is also a determinant of chronic obstructive pulmonary disease,[25] asthma,[26] myocardial infarction,[27] and type 2 diabetes.[28, 29]
- According to a Scottish study, smokers of all social positions have poorer survival rates than those in low social positions who have never smoked. Smoking by women also cancels out their survival advantage over men. In essence, neither affluence nor being female offers a defence against the toxicity of tobacco. The authors suggest that the scope for reducing health inequalities related to social position is probably limited unless many smokers in lower social positions can be enabled to stop smoking.[30]

Health Concerns Due to Alcohol Use:

- A recent study of the harms caused by the misuse of various drugs in the UK found that alcohol was the most harmful, when both harm to user and harm to others was considered.[31]
- According to a Canadian study, alcohol contributes to four percent of total global mortality and between four percent and five percent of global disability-adjusted life-years and thus is one of the largest avoidable risk factors for many disease categories, including alcohol-use disorders, cancer, cardiovascular disease, liver cirrhosis, and injury. The study found that certain patterns of drinking, especially heavy drinking occasions, contribute to this disease burden.[32]
- According to a 2010 CIHI report, alcohol was involved in 13% of Ontario hospital trauma cases in 2008-2009; among these cases, 44% were admitted due to motor vehicle collisions, 29% were admitted due to unintentional falls and 21% were admitted due to injury purposely inflicted by another person.[33]
- Despite the harms of alcohol related morbidity and mortality, alcohol is not high

on the global health agenda and, unlike tobacco and illicit drugs, no international policy is in place.[34]

Infectious Diseases

- On June 11, 2009, The World Health Organization (WHO) declared the start of the H1N1 influenza pandemic - with 30,000 confirmed cases reported in 74 countries.[35] It had been 41 years since the last pandemic was recorded in 1968.[36] The pandemic was declared over by the WHO on August 10, 2010.[37]
    - Based on preliminary data, the H1N1 influenza was expected to affect young and middle aged persons between the ages of 30 and 50, pregnant women, and people with underlying chronic conditions. This pattern was significantly different from that seen in epidemics of seasonal influenza, when most deaths occur among elderly people.[38]
    - As of August 1, 2010, worldwide, more than 214 countries and overseas territories had reported laboratory confirmed cases of H1N1, including over 18,449 deaths.[39]
    - In Canada, the impact of the H1N1 influenza on Aboriginal communities was of concern because of crowded housing conditions, younger populations, and higher pregnancy rates compared to non-Aboriginal communities.[40] Although Aboriginal people account for fewer than one in 25 people in Canada, they accounted for more than one in 10 recorded cases of H1N1 during the first wave of the outbreak in 2009, more than one in five H1N1 hospitalizations, almost one in six intensive care cases and more than one in 10 H1N1-related deaths.[41]
    - Nosocomial infections (hospital-acquired infections) such as *Clostridium difficile* (*C.difficile*) and Methicillin-resistant *Staphylococcus aureus* (MRSA) are of concern because of their increasing resistance to antibiotics and the difficulty of preventing these infections from spreading amongst patients in hospitals and other health care facilities.[42, 43]
    - According to two US surveillance studies, MRSA infection is a major public health problem primarily related to health care but no longer confined to intensive care units, acute care hospitals, or any health care institution.[44 ,45]
    - One study estimates that in 2005 there were 94,360 MRSA infection cases in the US with 18,650 cases associated with death. For the same year, approximately 16,000 people in the US died from AIDS, according to CDC figures.[46]
- Resistance to antimicrobial agents reduces resistance to therapies, which leads to increased susceptibility to infectious diseases.[47] Extensively drug-resistant tuberculosis (XDR-TB) is now a cause of great concern, as well as drug resistant diarrhoeal diseases, malaria, meningitis, respiratory tract infections, and HIV.[48]
- In the US, the infectious disease hospitalization rate in older adults increased 13% between 1990-1992 and 2000-2002. Over half of these hospitalizations were due to lower respiratory tract infections.[49]

Climate Change Effects on Health

It has been predicted that climate change will start affecting weather patterns and environmental conditions, thus supporting new disease vectors and environmental stresses on health.[50]

- Canada may experience extreme weather patterns and warmer climates, which could lead to an increase in illnesses such as asthma, allergies, and respiratory and cardiovascular stresses.[51]
- West Nile Virus cases have been increasing in Canada since 1999.[52] Canada had 2,215 confirmed cases of West Nile in 2007[53] compared to 151 in 2006.[54] More recently, however, the infection rate has plummeted; there were only 36 cases in 2008,[55] and 13 in 2009.[56]

- Skin cancer has now become the most common form of malignancy amongst fair-skinned people.[57]
- Climate change in Canada may contribute to an increase in vectors that carry dengue and dengue haemorrhagic fever, Lyme disease, encephalitis, and other tick-related diseases.[58]
- The number of known endemic areas of Lyme disease in Canada is increasing because the range of the tick vector is expanding in the eastern and central provinces due to warmer temperatures. As of 2009, physicians will now have to report clinically confirmed and suspected cases of Lyme disease to the national surveillance authority.[59]
- Climate change in Europe is predicted to support an increase in ticks and mosquitoes (which carry Lyme disease, malaria, arboviruses and dengue fever).[60]

EMERGING RESPONSES

Prevention through Lifestyle Changes

- The Canadian Population Health Initiative (CPHI) is working to advance population health understanding, and focuses on knowledge generation and synthesis, policy synthesis and analysis, knowledge transfer and reporting and knowledge exchange.[61]
- Research has suggested that a child's health behaviours are profoundly influenced by those of their peers and family members. [62, 63] As a result, programs such as the US Department of Health and Human Service's Ways to Enhance Children's Activity & Nutrition (WE CAN) national program have been developed. The WE CAN program is designed for families and communities to help children maintain a healthy weight by giving parents tips on how to cook with their children, how to read nutrition labels, and how to choose healthy snacks.[64]
- Research has shown that the physical environment (i.e., availability of green space, bike paths, access to fresh fruits and vegetable, etc.) is related to health.
    - An ICES study found that "activity-friendly" neighbourhoods in Toronto had the lowest rates of diabetes while neighbourhoods outside the downtown area had the higher rates of diabetes. "Activity-friendly" neighbourhoods were neighbourhoods that had more individuals who reported walking and bicycling and were less dependent on cars for travel. Further, neighbourhoods with poor access to healthy resources such as stores selling fresh fruits and vegetables had higher rates of diabetes.[65]
    - A UK study found that populations exposed to the greenest environments were less likely to have higher rates of mortality and circulatory disease compared to populations not exposed to green environments. Additionally, even populations living in the lowest income level areas had better health outcomes if exposed to green spaces. It has been suggested that green space might affect health by inducing beneficial physical activity and by ameliorating the response to stress.[66]

Obesity

- The Ontario Medical Association recommends that primary care providers screen for obesity during maintenance visits by measuring BMI and offering strategies to prevent the onset of overweight. Physicians should also suggest lifestyle changes including specific advice with regards to increasing physical activity.[67]
- Ontario's doctors are calling for calorie counts to be shown prominently on chain restaurant and school cafeteria menus and menu boards province-wide. Ontario's doctors would like to see menu labelling enacted to help parents and children make informed choices about the foods they eat. A recent survey by the Ontario Medical Association shows that over 80% of Ontarians support such an initiative.[68]
- Some of the Public Health Agency of Canada's initiatives to reduce obesity include a revised Canadian Food Guide, $5 million in funding towards ParticipACTION (a program to encourage active lifestyles), a

$33 billion infrastructure plan to provide reliable funding to provinces in order to support transportation projects such as bike paths, and WinterActive and SummerActive programs.[69]

- In 2010, the Assembly of First Nations announced their IndigenACTION initiative, which was founded to ensure Indigenous peoples in Canada have an opportunity to grow themselves and their communities through community fitness, wellness, sports and recreation. IndigenACTION will focus on relationships that support young Indigenous athletes and improve fitness and wellbeing in Indigenous communities. One of the main goals of the initiative is to improve health and combat obesity.[70]
- In order to change children's eating habits for the better, the European Commission (EC) has launched a new Healthy Eating Campaign for European school children. Three roadshows will tour seven European countries, each visiting two schools a day, reaching a total of 18,000 children in 180 schools. Using the slogan "Eat it, Drink it, Move it," the roadshows give children a chance to take part in educational activities and games. The EC also launched an interactive website, competitions and other events.[71]
- The US healthcare reform law established a Prevention and Public Health Fund. 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. The fund will go to programs for prevention, wellness, and public health activities including prevention research and health screenings, and immunization programs.[72]
- Progress has been made in some US states with respect to obesity-related legislation. Currently, 11 states have passed "Complete the Streets" legislation that mandates states to consider pedestrians and bicyclists when building, rebuilding, or renovating streets and surrounding areas. As well, 30 states have imposed "Snack Taxes" on soda and snacks.[73]
- In the US, the CDC recently unveiled LEAN*Works!*, a website designed to help businesses address obesity. The website is a synthesis of science and practice-based evidence to guide employers in planning, building, promoting, and assessing a worksite obesity prevention and control program.[74]
- Planet Health is a Massachusetts-based interdisciplinary program that focuses on nutrition and physical activity. It is designed for teachers to implement in schools and offers innovative approaches to health education. It is in its second edition, and has been in use by many teachers as a school-intervention program.[75]
- A study in Israel divided a group of 60 obese children into one of two interventions: 30 one-hour educational sessions about obesity management were provided to either the child or the parents. Seven years later, twice as many children whose parents received the intervention were no longer obese than children who had received the intervention themselves.[76]

Smoking

- Smoking bans have been implemented in several jurisdictions to protect non-smokers from exposure to secondhand smoke and provide a supportive environment for people who want to quit.[77]
    - A recent systematic review of 50 studies found that legislative bans reduced exposure to secondhand smoke.[78]
    - A 2009 study of a public smoking ban instituted in Saskatoon found that the incidence rate of acute myocardial infarction in the year after the smoking-ban legislation was 13% lower than in the year prior to the legislation, and that the relative reduction in smoking prevalence was 24.5% over the same period.[79]
- The internet is increasingly being used as a tool to deliver smoking cessation programs.[80] Features of online smoking cessation programs include: interactive quit planning tools, community chat groups, and online counselling.[81]
    - US web-assisted tobacco interventions such as QuitPlan.com and QuitNet.com have been

associated with increased abstinence rates among users.[82]
    - A recent systematic review found that internet -based interventions can assist smoking cessation, especially if the information is appropriately tailored to the users and there are frequent automated contacts with the users. More evidence is required, however about the long-term benefits of such interventions.[83]
- A 2009 study in Canada found that individuals who received an intensive smoking-cessation intervention (which included one hour of bed-side counseling, take-home material, and counseling calls for two months after discharge) were twice as likely as those as those who receive minimal intervention to report being abstinent after 3-, 6-, and 12-months.[84]
- In the UK, a trial of a school-based anti-smoking intervention, which trained student leaders to become peer supporters who informally encouraged fellow students to not smoke, found that students were 22% percent less likely to be smokers during the first 2 years of the intervention.[85]

Alcohol

- Action on the negative health effects of alcohol is beginning to take place. The European Union has developed a strategy including establishing an Alcohol and Health Forum to support member states in reducing alcohol related harm. To date, 108 commitments for concrete action have been made by the members of the forum to address the negative health effects of alcohol.[86]
- A recent review of alcohol policies found that making alcohol more expensive and less available and banning alcohol advertising are highly cost-effective strategies to reduce harm. Enforced legislative measures to reduce drink-driving and individually directed interventions to already at-risk drinkers are also effective, though school-based education does not reduce alcohol-related harm.[87]

Infectious Diseases

- In response to the severe acute respiratory syndrome (SARS) epidemic of 2003, the Ontario Ministry of Health and Long-Term Care (MOHLTC) released the Ontario Health Plan for an Influenza Epidemic (OHPIP). The OHPIP was created for situations like H1N1, so even before the WHO declared a global pandemic, the plan was being implemented in Ontario.[88]
    - According to Ontario's Chief Medical Officer of Health, a comparison of several different jurisdictions (other provinces and countries) on key indicators of H1N1's impact reveals that Ontario compares satisfactorily or very favourably to most of them.[89]
    - Despite having a significantly smaller proportion of vaccinations among individuals 12 years or older than all of Canada (the 2009/10 estimate for Ontario was 32.2%, the estimate for all 10 provinces was 41.3%),[90] an analysis of the cost-effectiveness of the mass H1N1 immunization program in Ontario found that the program was effective in preventing influenza cases and health care resource use and was also highly cost-effective despite the substantial program cost.[91]
- The Association of Medical Microbiology and Infectious Disease Canada (AMMI) supports research and education in infectious diseases and medical microbiology. They currently have a program in place to address the issue of hospital-acquired infections,[92] and are working to develop an antimicrobial stewardship curriculum for Medical Microbiology and Infectious Disease training programs, to provide new specialists with the skills to help other doctors use antibiotics appropriately.[93]
- The use of the Internet as a surveillance tool may be one way for researchers and the government to identify disease outbreaks early and raise public awareness of emerging disease trends.
    - Researchers in the US were able to reliably predict influenza-like illness (ILI) using search queries submitted

to Google. The model was able to accurately estimate the number of ILI-related physician visits in each region of the US, and because search queries can be processed quickly, the resulting ILI estimates were consistently one to two weeks ahead of the ILI surveillance reports generated by the Centers for Disease Control. The authors note that the model was not designed to be a replacement for laboratory-based surveillance and that it is vulnerable to false alerts due to sudden increases in ILI-related queries (e.g., a drug recall of a popular flu remedy), but suggest that early detection of ILI percentages may enable public health officials to mount a more effective early response in the event of a ILI pandemic.[94]

- Google Flu Trends provides near real-time estimates of flu activity based on aggregated search queries, and reports the general activity level as minimal, low, moderate, high, or intense.[95] The system supplies estimates for a number of countries and regions around the world, but is better suited to track disease activity in developed countries, because to be most effective, it requires large populations of Web search users.[96] Estimates can be viewed on the Google Flu Trends website—where they are presented as a map colour-coded by activity level—or downloaded for analysis.[97]
- An analysis of the 2008 *listeriosis* outbreak in Canada that resulted from contaminated deli meat found that individuals were searching the Internet on the topic of *listeriosis* before the outbreak was announced by the federal government on August 20, 2008. A search-term surveillance of the Internet using the word "*listeriorisis*" showed a spike in Internet queries beginning in mid to late July, nearly a month before the declaration of the public outbreak.[98]

- The Ontario Ministry of Health and Long-Term Care publicly reports *C.difficile*-associated disease (CDAD) rates of all hospitals on the ministry webpage.[99] According to ministry data, CDAD rates have been showing a small decline since reporting began. As well, media coverage has been less negative since CDAD public reporting has begun.[100]
- At the University of Miami hospital, a hand hygiene compliance pilot was implemented to reduce the percentage of bacteria-related infections that patients and physicians contract from not washing their hands with bacteria-killing soap. The pilot involves using small sensors in the medical center's soap dispensers that identify staff ID badges as well as monitor when and where physicians and other staff members wash their hands.[101]

Climate Change Effects on Health

- "Human Health in a Changing Climate: A Canadian Assessment of Vulnerabilities and Adaptive Capacity" is an investigation of the scope and magnitude of current and anticipated health impacts of climate change in Canada and Canada's adaptive ability.[102]
- A 2005 Health Canada *Health Policy Research Bulletin* highlighted the impact of climate change on human health and how Canadians can prepare and adapt.[103]
  - Efforts to protect Canadians from the impacts of climate change will likely entail revising, reorienting or strengthening public health policies and practices currently aimed at protecting, Canadians from air pollution (e.g., smog alerts), poor water quality (e.g., boil water advisories), vector-borne and zoonotic diseases (e.g., monitoring and surveillance), extreme weather events (e.g., emergency health services) and heat waves (e.g., "cooling off" locations).[104]
  - Northern communities are making great efforts to adapt to climate changes, for example by introducing community freezer programs to ensure food safety, and changing

hunting routes to protect against injury.[105]

- An updated "Health Effects of Climate Change in the UK – 2008 Report" discusses methods for assessing health implications of climate change, and potential measures aimed at mitigating effects. It also presents predictions of future health effects from climate change.[106]
- A 2008 WHO report "Protecting Health in Europe from Climate Change" outlines how the European Union can take a proactive approach in confronting climate change by developing and implementing action plans and polices to protect the population from extreme weather events.[107]
    - For example, the report discusses important elements of health-service preparedness for heat-waves that should be considered. This includes considering or providing: external shading of buildings, energy-efficient cooling facilities, sufficient drinking-water and appropriately adapted menus, energy-efficient buildings, appropriate staff scheduling and working arrangements, special care for patients and residents (identification of individuals at risk, adjustment of drugs and treatment), organization of home care (support and contact), and staff training in identifying heat-related health problems and appropriate treatment and cooling techniques.

REFERENCES

[1] Public Health Agency of Canada. What is the population health approach? Accessed October 2010: http://www.phac-aspc.gc.ca/ph-sp/approach-approche/index-eng.php

[2] *Ibid.*

[3] The Information Centre (2008). Statistics on obesity, physical activity and diet: England, January 2008. NHS. Accessed October 2010 at: http://www.ic.nhs.uk/webfiles/publications/opan08/OPAD%20Jan%202008%20final%20v6%20with%20links%20and%20buttons.pdf

[4] Prentice M. (2005). The emerging epidemic of obesity in developing countries. *International Journal of Epidemiology* 35(1), 93-99.

[5] Mokdad, A., Ford, E., Bowman, B., Dietz, W., Vinicor, F., Bales, V. & Marks, J. (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA, 289*(1), 76-79.

[6] Statistics Canada. *Table 105-0501 - Health indicator profile, annual estimates, by age group and sex, Canada, provinces, territories, health regions (2007 boundaries) and peer groups, occasional*, CANSIM (database). Accessed October 2010 at: http://cansim2.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&CNSM-Fi=CII/CII_1-eng.htm

[7] OMA 2008. Treatment of Childhood Overweight and Obesity. Accessed October 2010 at: https://www.oma.org/Resources/Documents/TreatmentOfChildhoodOverweight.pdf

[8] The Information Centre (2008). Statistics on obesity, physical activity and diet: England, January 2008. NHS. Accessed October 2010 at: http://www.ic.nhs.uk/webfiles/publications/opan08/OPAD%20Jan%202008%20final%20v6%20with%20links%20and%20buttons.pdf

[9] Deloitte Center for Health Solutions (2008). *Connected Care: Technology-Enabled Care at Home.* Accessed October 2010 at: http://public.deloitte.com/media/0285/us_chs_ConnectedCare_0308.pdf

[10] Finkelstein, E. A., Trogdon, J. G., Cohen, J. W. & Dietz, W. (2009). Annual medical spending attributable to obesity: Payer – and service – specific estimates. *Health Affairs, 28*(5), w822-w831.

[11] Renehan, A.G., Tyson, M., Egger, M., Heller, R.F. & Zwahlen, M. (2008). Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *The Lancet, 371,* 569-578.

[12] Neovius, M., Sundstrom, J. & Rasmussen, F. (2009). Combined effects of overweight and smoking in late adolescence on subsequent mortality:

Nationwide cohort study. *British Medical Journal, 338*, b496 doi:10.1136/bmj.b496.

[13] Mokdad, A., Ford, E., Bowman, B., Dietz, W., Vinicor, F., Bales, V., Marks, J. (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors. *JAMA, 289*(1), 76-79.

[14] Ford E.(2005). The epidemiology of obesity and asthma. *Journal of All Clin Immunol* 115(5), 897-909.

[15] World Health Organization (2009). WHO Report on the Global Tobacco Epidemic, 2009: Implementing Smoke-Free Environments. Accessed October 2010 at: http://whqlibdoc.who.int/publications/2009/9789241563918_eng_full.pdf

[16] Ontario Ministry of Health Promotion and Sport (2010). *Creating a Smoke-Free Ontario*. Accessed October 2010 at: http://www.mhp.gov.on.ca/en/smoke-free/accomplishments.asp

[17] Health Canada. Canadian Tobacco Use Monitoring Survey (CTUMS) 2008. Summary of Annual Results for 2008. Retrieved August 13, 2009 from: http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutc_2008/ann_summary-sommaire-eng.php

[18] Jarvis M. (2003). Monitoring cigarette smoking prevalence in Britain in a timely fashion. *Addiction* 98(11), 1569-1574.

[19] Osler M, Prescott E, Gottschau A, Bjerg A, Hein A, Sjøl A, P Schnohr. (1998). Trends in smoking prevalence in Danish adults, 1964—1994. *Scandinavian Journal of Public Health* 26, 293 – 298.

[20] Barclay, E. (2009). Outlook hazy for smoking rates in the USA. *The Lancet* 373, 1415.

[21] Baliunas D, Patra J, Rehm J, Popova S, Kaiserman M. & Taylor B. (2007). Smoking-attributable mortality and expected years of life lost in Canada 2002: conclusions for prevention and policy. *Chronic Disease Canada* 27, 154-162.

[22] Lee CH, Ko YC, Goggins W, Huang JJ, Huang MS, Kao EL, Wang HZ. (2000). Lifetime environmental exposure to tobacco smoke and primary lung cancer of non-smoking Taiwanese women. *International Journal of Epidemiology* 29, 224-231.

[23] Tredaniel J, Boffetta P, Saracci R, Hirsch A. (1994). Exposure to environmental tobacco smoke and risk of lung cancer: the epidemiological evidence. *Eur Respir J* 7, 1877-1888.

[24] Shopland DR, Eyre HJ, Peachacek TF. (1991). Smoking attributable cancer mortality in 1991: Is lung cancer now the leading cause of death among smokers in the United States? *J Natl Cancer Inst* 83(16), 1142-1148.

[25] Westmaas J, Brandon T. (2004) Reducing risk in smokers. *Curr Opin Pulm Med* 10(4), 284-288.

[26] Ulrik C, Lange P. (2001). Cigarette smoking and asthma. *Monaldi Arch Chest Dos* 56, 349-353.

[27] Hay D, Turbott S. (1970). Changes in smoking habits in men under 65 years after myocardial infarction and coronary insufficiency. *Br Heart J* 32, 738-740.

[28] Al-Delaimy W, Manson J, Solomon C, Kawachi I, Stampfer M, Willett W, Hu F. (2002). Smoking and mortality among women with type 2 diabetes. *Arch Intern Med* 162, 273-279.

[29] Johnson K, Bazargan M, Cherpitel C. (2001). Alcohol, tobacco, and drug use and the onset of type 2 diabetes among inner-city minority patients. *J Am Board Fam Pract* 14, 430-436.

[30] Gruer, L., Hart, C.L., Gordon, D.S. & Watt, G.C.M. (2009). Effect of tobacco smoking on survival of men and women by social position: A 28 year cohort study. *British Medical Journal* 338, b480 doi:10.1136/bmj.b480

[31] Nutt, D. J., King, L. A., & Phillips, L. D. (2010). Drug harms in the UK: A multicriteria decision analysis. *The Lancet,* epublication ahead of print. Published Online November 1, 2010 DOI:10.1016/S0140-6736(10)61462-6

[32] Rehm, J., Mathers, C., Popova, S., Thavorncharoensnap, M., Teerawanon, Y. & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *The Lancet* 373, 2223-2233.

[33] Canadian Institute for Health Information (2010). *Ontario Trauma Registry 2009 Report: Major Injury in Ontario*. Accessed October 2010 at: http://secure.cihi.ca/cihiweb/products/otr_major_injury_ontario_2009_e.pdf

[34] Casswell, S. & Thamarangsi, T. (2009). Reducing harm from alcohol: Call to action. *The Lancet* 373, 2247-2257.

[35] World Health Organization. June 11, 2009. World now at the start of 2009 influenza pandemic. Accessed October 2010 at: http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/index.html

[36] Barry, J.M. (2009). White paper on novel H1N1. Prepared for the MIT Centre for Engineering Systems Fundamentals. ESD-WP-2009-07.

[37] World Health Organization. H1N1 in post-pandemic period: Director-General's opening statement at virtual press conference. Accessed November 2010 at: http://www.who.int/mediacentre/news/statements/2010/h1n1_vpc_20100810/en/index.html

[38] World Health Organization. June 11, 2009. World now at the start of 2009 influenza pandemic. Accessed October 2010 at: http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/index.html

[39] World Health Organizations. August 10, 2010. Pandemic (H1N1) 2009 – Update 112. Accessed October 2010 at: http://www.who.int/csr/don/2010_08_06/en/index.html

[40] The Globe and Mail. 2009 August 18. Inuit will be hit worst by swine flu, leaders fear. Retrieved August 18, 2009 from: http://www.theglobeandmail.com/news/national/inuit-a-high-risk-for-swine-flu-leaders-fear/article1255163/

[41] The Winnipeg Free Press, 2010, October 22. Aborigianls helpless against H1N1 outbreak: Poor living conditions a factor, hearing told. Accessed October 2010 at: http://www.winnipegfreepress.com/canada/aboriginals-helpless-against-h1n1-outbreak-105510143.html

[42] The Globe and Mail. 2009 June 26. Have cutbacks hurt infection control in BC? Retrieved August 18, 2009 from: http://www.theglobeandmail.com/news/national/british-columbia/have-cutbacks-hurt-infection-control-in-bc/article1197950/

[43] Klevans, R.M., Morrison, M.A., Nadle, J. et al. (2007). Invasive Methicillin-Resistant *Staphylococcus aureus* infections in the United States. *JAMA* 298(15), 1763-1771.

[44] *Ibid.*

[45] Edelsberg, J., Taneja, C., Zervos, M., Haque, N., Moore, C., Reyes, K., Spalding, J., Jiang, J. & Oster, G. (2009). Trends in US hospital admissions for skin and soft tissue infections. *Emerging Infectious Diseases* 15(9), 1516-1518.

[46] WebMD. 2007 October 16. More US deaths from MRSA than AIDS. Retrieved August 18, 2009 from: http://www.webmd.com/news/20071016/more-us-deaths-from-mrsa-than-aids

[47] World Health Report 2007: A Safer Future: Global Public Health Security in the 21st Century. World Health Organization. Geneva. 2007.

[48] *Ibid.*

[49] Curns, A. T., Holman, R. C., Sejvar, J. J., Owings, M. F., Schonberger, L. B. (2005). Infectious disease hospitalizations among older adults in the United States from 1990-2002. *Archives of Internal Medicine, 165,* 2514-2520.

[50] Health Canada (2006). Understanding the Health Impacts of Climate Change. Accessed October 2010 at: http://www.hc-sc.gc.ca/ewh-semt/climat/impact/index-eng.php

[51] *Ibid.*

[52] Komar N. (2003). West Nile Virus: Epidemiology and ecology in North America advances in virus research. 61, 185-234.

[53] Public Health Agency of Canada. Human West Nile Virus Clinical Cases and Asymptomatic Infections in Canada: 2007. Accessed October 2010 at: http://www.phac-aspc.gc.ca/wnv-vwn/mon-hmnsurv-2007-eng.php

[54] Publich Health Agency of Canada. Human West Nile Virus Clinical Cases and Asymptomatic Infections in Canada: 2006. Accessed October 2010 at: http://www.phac-aspc.gc.ca/wnv-vwn/mon-hmnsurv-2006-eng.php

[55] Public Health Agency of Canada. Human West Nile Virus Clinical Cases and Asymptomatic Infections in Canada: 2008. Accessed online at: http://www.phac-aspc.gc.ca/wnv-vwn/mon-hmnsurv-2008-eng.php

[56] Public Health Agency of Canada. Human West Nile Virus Clinical Cases and Asymptomatic Infections in Canada: 2009. Accessed October 2010 at: http://www.phac-aspc.gc.ca/wnv-vwn/mon-hmnsurv-2009-eng.php

[57] Norval, M., Cullen, A. P., de Gruijl, F. R., Longstreth, J., Takizawa, Y., Lucas, R. M., Noonan, F. P., & van der Leun, J. C. (2007). The effects on human health from stratospheric ozone depletion and its interactions with climate change. *Photochemical and Photobiological Sciences, 6*(3), 232-251.

[58] Githeko, A., Lindsay, S., Confalonieri, U., & Patz, J. (2000). Climate change and vector-borne diseases: A regional analysis. *Bulletin of the World Health Organization, 78*(9), 1136-1147.

[59] Ogden, N. H., Lindsay, L. R., Morshed, M., Sockett, P. N. & Artsob, H. (2009). The emergence of Lyme disease in Canada. *Canadian Medical Association Journal, 180*(12), 1221-1224.

[60] *Ibid.*

[61] Canadian Institute for Health Information. About thehe Canadian Population Health Initiative. Accessed October 2010 at: http://www.cihi.ca/CIHI-ext-portal/internet/en/document/factors+influencing+health/environmental/cphi_about

[62] Beal, A. C., Ausiello, J. & Perrin, J.M. (2001). Social influences on health-risk behaviors among minority middle school students. *Journal of Adolescent Health, 28*(6), 474-480.

[63] King, K.A., Tergerson, J.L. & Wilson, B.R. (2008). Effect of social support on adolescent's perceptions of and engagement in physical activity. *Journal of Physical Activity and Health, 5*(3), 347-384.

[64] Department of Health and Human Services (2009). WE CAN! Ways to enhance children's activity and nutrition. Accessed October 2010: http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan/

[65] Creatore, M. I., Booth, G. L., Glazier, R. H. Ethnicity, Immigration and Diabetes. In: Glazier RH, Booth GL, Gozdyra P, Creatore MI, Tynan, M, editors. *Neighbourhood Environments and Resources for Healthy Living—A Focus on Diabetes in Toronto: ICES Atlas.* Toronto: Institute for Clinical Evaluative Sciences; 2007.

[66] Mitchell, R. & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: An observational population study. *The Lancet, 372*, 1655-1660.

[67] Ontario Medical Association. (2009). Treatment of Childhood Overweight and Obesity. Ontario Medical Review 19-36. Accessed October 2010 at: https://www.oma.org/Resources/Documents/TreatmentOfChildhoodOverweight.pdf

[68] Ontario Medical Association website. Ontario's Doctors Call for Calorie Labelling on Fast Food and Cafeteria Menus. Accessed October 2010 at: https://www.oma.org/Mediaroom/PressReleases/Pages/CallforCalorieLabelling.aspx

[69] Public Health Agency of Canada (2008). Childhood Obesity and the Role of the Government of Canada. Accessed October 2010 at: http://www.phac-aspc.gc.ca/ch-se/obesity/pdf/chobesity_e.pdf

[70] Assembly of First Nations (2010). *IndigenACTION: Community Fitness and Health Through Sports and Recreation*. Accessed November 2010 at: http://www.afn.ca/misc/IndigenACTION-Background.pdf

[71] European Union (2009). *EU Healthy Eating Campaign "The Tasty Bunch" – A new initiative to promote healthy lifestyle and balanced diet among kids.* Europa Press Release, accessed November 2010 at: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1366&format=PDF&aged=0&language=EN&guiLanguage=en

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

[73] Trust for America's Health. (2009). Supplement to "F as in Fat: How Obesity Policies Are Failing in America, 2009" Obesity-Related Legislation Action in States, Update. Accessed October 2010 at: http://healthyamericans.org/reports/obesity2009/StateSupplement2009.pdf

[74] Centers for Disease Control and Prevention website. CDC's LEAN *WORKS!* – A workplace obesity prevention program. Accessed October 2010 at: http://www.cdc.gov/leanworks/about.html

[75] Planet Health website. Accessed October 2010 at: http://www.planet-health.org/programOverview.cfm

[76] Ontario Medical Association. (2009). Treatment of Childhood Overweight and Obesity. Ontario Medical Review 19-36. Accessed October 2010 at: https://www.oma.org/Resources/Documents/TreatmentOfChildhoodOverweight.pdf

[77] Callinan, J. E., Clarke, A., Doherty, K. & Kelleher, C. (2010). Legislative smoking bans for reducing secondhand smoke exposure, smoking prevalence and tobacco consumption. *Cochrane Database of Systematic Reviews* 2010, Issue 4. Art. No.: CD005992. DOI: 10.1002/14651858.CD005992.pub2.

[78] *Ibid.*

[79] Lemstra, M., Neudorf, C., & Opondo, J. (2008). Implications of a public smoking ban. *Canadian Journal of Public Health, 99*(1), 62-65.

[80] Bock, B.C., Graham, A.L., Whitely, J.A. & Stoddard, J.L. (2008). A review of web-assisted tobacco interventions (WATIs). *Journal of Medical Internet Research, 10*(5), e39.

[81] Cunningham, J.A. (2008). Access and interest: Two important issues in considering the feasibility of web-assisted tobacco interventions. *Journal of Medical Internet Research, 10*(5), e37.

[82] An, L.C., Schillo. B.A., Saul, J.E., Wendling, A.H., Klatt, C.M., Berg, C.J., Ahulwalia, J.S., Kavanaugh, A.M., Christenson, M. & Luxenberg, M.G. (2008). Utilization of smoking cessation informational, interactive, and online community resources as predictors of abstinence: Cohort study. *Journal of Medical Internet Research, 10*(5), e55.

[83] Civljak, M., Sheikh, A., Stead, L. F., & Car, J. (2010). Internet-based interventions for smoking cessation. *Cochrane Database of Systematic Reviews* 2010, Issue 9. Art. No.: CD007078. DOI: 10.1002/14651858.CD007078.pub3.

[84] Smith, PM & Burgess E (2009). Smoking cessation initiated during hospital stay for patients with coronary artery disease: a randomized controlled trial. CMAJ, *180*(13), 1297-1303.

[85] Campbell, R., Starkey, F., Holliday, J., Audrey, S., Bloor, M., Parry-Langdon, N., et al. (2008). An informal school-based peer-led intervention for smoking prevention in adolescence (ASSIST): a cluster randomized trial. *The Lancet, 371*, 1595-1602.

[86] European Union. April 20, 2009. Commitments made by members of the European alcohol and health forum: Summary report. Accessed October 2010 at: http://ec.europa.eu/health/ph_determinants/life_style/alcohol/Forum/docs/report_commitments_en.pdf

[87] Anderson, P., Chisholm, D., & Fuhr, D. C. (2009). Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. *Lancet, 373*, 2234–2246.

[88] King, A. (2010). *The H1N1 Pandemic – How Ontario Fared: A Report by Ontario's Chief Medical Officer of Health.* Accessed October 2010 at: http://www.health.gov.on.ca/en/public/publications/ministry_reports/cmoh_h1n1/cmoh_h1n1_20100602.pdf

[89] King, A. (2010). *The H1N1 Pandemic – How Ontario Fared: A Report by Ontario's Chief Medical Officer of Health.* Accessed October 2010 at: http://www.health.gov.on.ca/en/public/publications/ministry_reports/cmoh_h1n1/cmoh_h1n1_20100602.pdf

[90] Statistics Canada (2010). Table 1: Percentage of the Canadian household population (excluding the territories) aged 12 and over who reported reveiving the H1N1 vaccination in the 2009/2010 flu season, by age, province and sex. Accessed October 2010 at: http://www.statcan.gc.ca/daily-quotidien/100719/t100719b1-eng.htm

[91] Sander, B., Bauch, C. T., Fisman, D., Fowler, R. A., Kwong, J. C., Maetzel, A., et al. (2010). Is a mass immunization program for pandemic (H1N1) 2009 good value for money? Evidence from the Canadian experience. *Vaccine, 28*, 6210-6220.

[92] Association of Medical Microbiology and Infectious Disease Canada website: Canadian Hospital Epidemiology Committee. Accessed October 2010 at: http://www.ammi.ca/the_society/chec.php

[93] Association of Medical Microbiology and Infectious Disease Canada website: Announcements and Press Releases. Accessed October 2010 at: http://www.ammi.ca/media_centre/announcements.php?pg_type=society

[94] Ginsberg, J., Mohebbi, M. H., Patel, R. S., Brammer, L., Smolinski, M. S. & Brilliant, L. (2009). Detecting influenza epidemics using search engine query data. *Nature, 457*, 1012-1015.

[95] Google Flu Trends website: Frequently Asked Questions. Accessed November 2010 at: http://www.google.org/flutrends/about/faq.html#googleorg

[96] Carneiro, H. A. & Mylonakis, E. (2009). Google trends: A web-based tool for real-time surveillance of disease outbreaks. *Clinical Infectious Diseases, 49*, 1557–1564.

[97] Google Flu Trends website: Frequently Asked Questions. Accessed November 2010 at: http://www.google.org/flutrends/about/faq.html#googleorg

[98] Wilson, K. & Brownstein, J.S. (2009). Early detection of disease outbreaks using the internet. *Canadian Medical Association Journal, 180*(8), 829-831.

[99] Ministry of Health and Long-Term Care. 2009 June 30. Reporting *C.diffiicle* rates in hospitals. Accessed October 2010 at: http://www.health.gov.on.ca/en/news/release/2009/jun/bg_20090630.aspx

[100] Ministry of Health and Long-Term Care. Health Analytics Branch. August 2009.

[101] HealthcareITNews. 2009 July 30. University of Miami launches hygiene compliance supported by RTLS. Retrieved August 18, 2009 from: http://www.healthcareitnews.com/news/university-miami-launches-hygiene-compliance-supported-rtls

[102] Health Canada (2008). Health Canada Releases New Report on Climate Change. Accessed October 2010 at: http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/_2008/2008_122-eng.php

[103] Health Canada. (2005). Climate Change: Preparing for the Health Impacts. Accessed November 2010 at: http://www.hc-sc.gc.ca/sr-sr/alt_formats/hpb-dgps/pdf/pubs/hpr-rps/bull/2005-climat/2005-climat-eng.pdf

[104] *Ibid.*

[105] *Ibid.*

[106] Department of Health. Health Effects of Climate Change in the UK 2008. An update of the Department of Health report 2001/2002. Accessed October 2010 at: http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_082836.pdf

[107] World Health Organization (2008).*Protecting Health in Europe from Climate Change.* Accessed October 2010 at: http://www.euro.who.int/__data/assets/pdf_file/0016/74401/E91865.pdf