

## **Climate Change and Health Impacts**

*Presentation by Dr. David McKeown, Medical Officer of Health for the City of Toronto  
[Delivered at the Downtown Sheraton Centre in Toronto, May 29, 2006]*

*To the 40th CMOS Congress entitled:  
Weather Oceans & Climate \_ Exploring the Connections*

I am honoured to join you today for this important event. I would like to share with you some thoughts about how climate change may be affecting human health now, and how it is expected to affect us all even more in the future.

I can see from the conference program that your focus is on the natural environment - particularly on weather, oceans and climate, but I also see that the theme for this conference is "Exploring the Connections." As you listen to the scientific presentations over the next few days, I encourage you to consider other connections as well, particularly how climate change is disrupting the lives of many people in Canada and other countries, and how we might work together across disciplines and organizations to adapt to climate change.

As a society we are recognizing that human behaviour over the last century has brought unprecedented environmental changes such as loss of biodiversity, pervasive environmental contamination, depleted stratospheric ozone and global climate change. We also have a growing awareness of the degree to which the health of human populations, globally and locally, is being affected by such large scale alterations in our ecosystems.

The tragedy of the prolonged and extreme heat wave in Europe during the summer of 2003 serves as a reminder of our fragility as a species and our dependence on the environment for life and health, even in wealthy communities in developed countries. The heat wave that hit Europe began in June and lasted until mid-August. Temperatures were 20 to 30% higher than normal that summer, reaching peaks of 35 to 45 °C in Cities. Health authorities reported 35,000 heat-related deaths in Europe - about 15,000 deaths in France, 10,000 in Italy, 7,000 in Germany and 3,000 in Spain. Many factors were at play such as the special vulnerability of frail seniors, inadequate community and medical response, and the impact of a built environment that amplified heat levels in cities.

Since we are here in Toronto I would like to use this City as an example of how climate change is likely to impact the health of urban residents. These impacts are not unique to Toronto, given that about 80% of Canada's population now lives in urban settings.

We are a city of 2.5 million inhabitants, located downwind of significant air pollution from coal-fired power plants south of the Canadian border. Like other North American cities, cars and trucks are the leading source of air pollutants generated within Toronto's borders. In 2004 Toronto Public Health published updated estimates of the burden of human illness associated with air pollution. Our research suggests that on average, about 6,000 hospital admissions and 1,700 premature deaths are attributable to air pollution each year in Toronto.

Last year we released the results of further research conducted jointly with Environment Canada, in which we examined historical data on air pollution, weather patterns, and mortality over the period 1954\_2000. These past trends, projected into the future, indicate that with the onset of hotter summers due to climate change, pollution-related deaths are expected to increase by 20% by the year 2050. Much of this additional mortality will be due to anticipated increases in ground-level ozone generated by higher temperatures.

The same historical analysis also determined that Toronto has experienced an average of 120 heat-related deaths per year over the past 45 years. The records showed a high degree of variability in heat-related deaths from year to year, and this mortality was significantly higher for the elderly and for those with cardiovascular illness. It was also clear that the longer the heat episode, the greater the daily mortality rate. Exposure to extreme heat over prolonged periods of time without cooling intervals, such as typically occurs at night, makes it difficult for the human body to maintain a consistent internal temperature. Even a short break from extreme heat of a few hours can protect health. Through application of climate change models, we projected this type of heat-related mortality would double by 2050 and triple by 2080 if adaptive mechanisms were not put in place.

The summer of 2005 was the hottest and smoggiest summer in Toronto on record, with 41 days over 30 . C and 48 smog alert days. Of particular concern from a health perspective was the longer duration of heat episodes in 2005 than has been typical in the past.

Since 1999, Toronto has implemented a Hot Weather Response Plan designed to protect vulnerable populations in the community. The response plan is activated by a heat alert warning system which relies on weather forecast data from Environment Canada, input into a computer model to predict the likelihood of heat-related mortality. The response plan includes:

- advising the public through the media and in other ways of the need to watch out for at-risk family members and neighbours,
- co-ordination of community-based agencies to support homeless and vulnerable populations,
- door-to-door outreach to isolated vulnerable adults in substandard housing,
- additional paramedic teams to assess people with heat-related illness and transport them to hospital if necessary, and
- opening municipal facilities as public cooling centres.

Last year's exceptional summer appears to be part of a long-term trend. Average annual temperatures have risen steadily over the last century in the city, with summers becoming hotter and winters milder. Research by climatologists suggests that the oppressively hot summer of 2005 may become a more frequent occurrence with predictable risks for human health. In addition to illness triggered by air pollution and that caused directly by heat exposure, it is

reasonable to expect that climate change will also alter patterns of other human health problems which are closely linked to the natural environment. One type of health risk which fits this definition is communicable disease transmitted by insect vectors.

West Nile Virus is a vector-borne disease which first caused human illness in Toronto in 2002. It primarily affects birds but can be spread to humans and other mammals by mosquitoes when environmental conditions are favourable. We still have much to learn about how the transmission of West Nile Virus is affected by climate but it appears that hot summers, warm winters and spring droughts provide ideal conditions for mosquitoes to breed and increase the risk of human infection. Warmer temperatures also appear to increase the replication of the West Nile Virus in the bodies of mosquitoes. In Toronto, 38 human cases of WNV were recorded last year, compared with 6 the year before when weather conditions were less extreme. We'll be monitoring the link between West Nile Virus and climate closely over the next few years.

Another vector-borne disease which should concern us here in Toronto is Lyme disease, a chronic and debilitating infection transmitted through the bite of the black-legged tick that carries the disease organism. Lyme disease infects about 20,000 people each year in the United States, but only about 50 in Canada, because the geographic range of this tick is at the southern edge of Ontario. A warmer climate would create suitable conditions for the northward expansion of the tick vector into Canada, and with it the potential for more Lyme disease.

The warmer temperatures which accompany climate change may also enhance the survival and growth of pathogens in food products. Foodborne illness is one of the most common communicable diseases, and causes morbidity and economic costs on a large scale. Incidence typically peaks in the summer months, and this trend could become more pronounced with hotter summers.

Many other health impacts are more speculatively associated with climate change, including mental health problems experienced by people displaced during extreme weather events, or those whose livelihood in forestry, farming or fishing is affected.

Urban populations such as Toronto's already face many environmentally mediated health problems associated with urban growth, and environmental contamination. Climate change is expected to exacerbate some of these impacts. Because a degree of climate change in the next few decades is believed to be inevitable, we must plan adaptive strategies to protect human health. Heat warning systems such as the one implemented in Toronto and some other North American cities are a small example.

The scientific work that will be discussed at this conference over the next few days is vital to our understanding of how to respond to our changing climate. I look forward to enhanced collaboration between sectors and disciplines, particularly those that span health and the environment. And I am hopeful that scientific gatherings such as this one will stimulate knowledge transfer, so that research findings will inform relevant and timely public policy and programs aimed at mitigating and adapting to climate change. Thank you.