How Toronto and Montreal (Canada) Respond to Heat

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Summary

It is only during the last five years that Canadian cities have begun to develop formal programs to protect the public's health from the effects of summertime heat. Toronto's (Ontario) Hot Weather Response Plan followed recommendations from advisory committees for seniors and for the homeless. The public health department was confronted with a rain-storm on the first day, in 1999, that it issued a heat alert. Toronto has since instituted a two-level alert and emergency response with action levels based on the estimation of mortality impacts through a synoptic model developed at the University of Delaware. Key to the program is media alerts and community partnerships to aid vulnerable people. Montreal's (Quebec) approach has been to issue public advisories based on real and apparent temperature thresholds elaborated in collaboration with the Canadian Meteorological Service. Montreal has instituted a program of research and action designed to inform the population and to identify and mitigate population vulnerabilities in order to make residents more resistant to the effects on health of heat. Priority areas for health protection include hospitals and nursing homes, few of which are now air-conditioned; rather than retrofit air conditioning, relative air-cooling and air dehumidification have been proposed where feasible. In the community, local health centers target their vulnerable elderly clients requiring follow-up during heat waves based on the identification of factors such as dehydrating medications, social isolation, and lack of access to a nearby cooling room. A heat wave emergency response plan, based on the mobilization and updating of existing programs, is coordinated by civil defense authorities, advised by the city's public health department.

Introduction

Toronto and Montreal are Canada's largest urban centers. Various climatologic, environmental, demographic, and socio-economic factors place the populations of Toronto and Montreal at risk of illness and death from summertime heat (Smoyer-Tomic and Rainham 2001). Toronto's (Ontario) Hot Weather Response Plan followed recommendations from advisory committees for seniors and for the homeless. The public health department was confronted with a rain-storm on the first day, in 1999, that it issued a heat alert. Montreal's (Quebec) approach has been to issue public advisories based on real and apparent temperature thresholds elaborated in collaboration with the Canadian Meteorological Service. Montreal has instituted a program of research and action designed to inform the population and to identify and mitigate population vulnerabilities in order to make residents more resistant to the effects on health of heat. This paper briefly describes the Montreal and Toronto responses to heat. Since 1998, the two cities have initiated active heat preparation and response strategies. The contrasting experiences with and responses to summertime heat by authorities in Toronto and Montreal should interest European colleagues.

Toronto

Toronto (2001 population: 2.4 million) has a continental climate with cool winters and warm summers. In 1998, following several summers hotter than those of the 1980s, and alerted by the devastating effects of recent summer heat waves in Philadelphia, St. Louis, and Chicago, US cities whose climate is similar to Toronto's, Toronto Public Health (TPH) drafted a Hot Weather Response Plan. Advisory Committees for Seniors and for the health of Homeless and Socially Isolated Persons promoted the initiative. The plan was based on two parallel activities: the identification of threshold weather conditions for the implementation of population heat alerts, and the development of an emergency response plan in partnership over 800 City of Toronto agencies, health care organizations, and non-governmental groups.

For 1999, TPH set interim action levels of 40° humidex equivalent (humidex is an apparent temperature equivalent calculated from dry temperature and relative humidity and is reported by the Canadian Weather Service) for putting out heat alerts, and 45° humidex equivalent for the implementation of emergency measures.

Under the Hot Weather Response Plan, TPH monitored humidex levels, declared the heat alert or heat emergency, disseminated the notification of heat alerts to the media, and coordinated the response plan. TPH collected information on the health effects of hot weather; strategies to decrease risk of heat related illness; safe fan use in hot weather; and the interaction between some medications and hot weather. This was disseminated through four fact sheets available on the TPH website and sent to community agencies. Community partners make Hot Weather Tip Sheets available to clients and area residents and post the heat "alert" press releases. They contact their vulnerable clients during heat waves to ensure they are in good health and provide advice on how to lessen heat stress. The Parks and Recreation Department and the Library Board identified local community centers and libraries as places for people to cool off. Parks and Recreation increased access to public (swimming) pools and agreed to relax the restrictions on homeless people staying overnight in city parks. The Out of the Cold program, Community Health Centers, Community Care Access Centers, and Ontario Community Support Associations provided outreach to vulnerable members of the community including the homeless, under-housed, and frail, isolated, seniors. For example, Anishinawbe Health Toronto, a Community Health Center focusing primarily on the aboriginal population, stepped up their street patrol in order to identify and help the homeless during a heat alert. Tokens for Toronto Transit were made available to help people on the street get to a cooler place. The Red Cross provided training on heat-related illness and first aid to staff and volunteers of community agencies. (Basrur, 2002).

The plan was put into effect in May 1999 and TPH monitored weather conditions daily. The first heat alert was called in early August 1999. Although the weather forecast met conditions for the calling of a Heat Alert, the day itself was "gray, rainy, and cool."

In 2000, Toronto Public Health, together with the Toronto Atmospheric Fund, an activist research consortium, was granted funds to develop a more predictive heat/health warning (alert) system (HHWS) for Toronto. The University of Delaware, and Dr. Lawrence Kalkstein, were contracted to develop the HHWS on the basis of a 17-year retrospective analysis of daily mortality in relation to a range of local weather factors. The HHWS was designed to replace the use of humidex-based action levels for the declaration of heat alerts and emergencies.

By 2001, the HHWS was in operation. Based on past mortality experience, the HHWS translated weather forecasts into a likelihood that the number of daily deaths would surpass those expected based on a long-term average. When the HHWS expressed a probability of excess deaths at 65 – 89 % a "Heat Alert" was called by TPH and the response plan was activated. If the system predicted 90 % or greater chance that the number of excess deaths would be more than predicted, a "Heat Emergency" was called. Further, it was decided that Toronto Public Health would call a heat emergency only on days preceded by a heat alert, so as to allow enough time for the response plan to be put into effect.

By 2001, new partners had joined the response team, and new functions added. The Red Cross provided a Heat Information (telephone) Line. Toronto's Emergency Medical Services established a program whereby a paramedic and a Red Cross volunteer could visit the home of callers to the Heat Information Line judged to be in distress but at a level not grave enough to warrant emergency transport; where indicated, medical advice and recommendations for personal and residential cooling were provided. The City set up staffing and plans to open four cooling centers during heat emergencies, including one with overnight capacity. At these centers, bottled water, snacks, cots, and air-conditioned space are made available to all who need it. In addition, bottled water is provided to the homeless through "street patrols" run by some community partners.

The summer of 2001 put the Hot Weather Response Plan to the test. Six heat alerts and three heat emergencies were called. 401 persons called the Heat Information Line during the emergency days: of these, 28 were referred directly to emergency responders, and 23 received a home visit. Approximately 1700 people visited the cooling centers and 20 – 36 stayed overnight at the cooling center open 24 hours. Extensive media coverage provided heat safety to the public. In 2002, the weather was even hotter, and TPH called Heat Alerts on 15 days while two days reached Heat Emergency conditions. During the two Heat Emergency days, 1800 people used the cooling centers.

Toronto Public Health has, with its partners, promoted research into such urban heat adaptive measures as the use of cool surfaces and shade vegetation. A joint research project with the Canadian Meteorological Service is designed to target alert and emergency days on the basis of the joint effects of weather and air pollution. In addition, TPH and Toronto Emergency Medical Services are partnering with hospital emergency departments to measure the effects of heat on emergency room use in order to incorporate morbidity concerns into the Heat Watch Warning (Alert) System.

Montreal

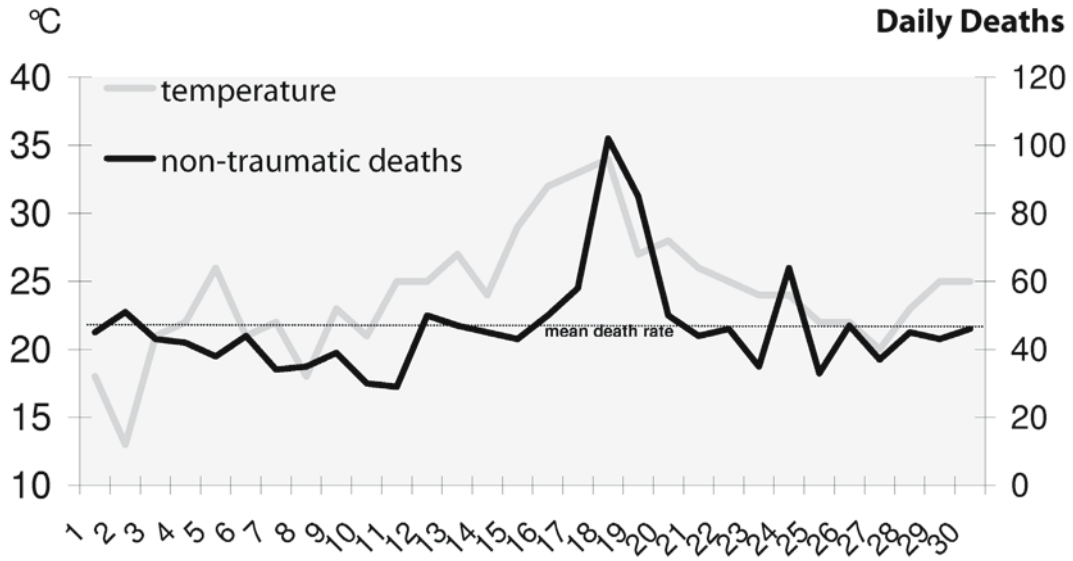
Montreal (2001 population: 1.8 million) is 500 km northeast of Toronto with a climate that is slightly cooler and is affected by weather fronts which typically arrive a day later. Montreal occupies a river island; the design of housing reflects insulation from the cold more than accommodation to summertime heat. As with Toronto, both the number of very hot days and average summer temperatures were higher in the 1990s than during previous decades: while average summer mean temperature was 19.4 ° during the period 1971 – 2000, it was 20.5 ° in 2002, and 20.7 ° in 2003 (Jennifer Milton, Canadian Meteorological Service, Quebec Region, personal communication). Also as with Toronto, although there has been a general awareness that summer heat is harmful to health and well being, there is no record that Montreal has suffered a killer "heat wave" such as occurred in Chicago in 1995. In fact, few diagnoses compatible with heat injury were recovered in a retrospective review of coroner's reports, death certificates, hospital discharge summaries, and emergency room files for Montreal residents during the period of the 1990s (Kousavilis AT and Kosatsky T 2003).

During the period 1998 – 2003, the Direction de Santé publique de Montréal (DSP or Montreal Public Health Authority) has become active in planning for summer heat waves. Various factors have motivated this initiative:

- Ongoing studies showing an association between numbers of deaths and maximum daily temperature *(Fig. 1)* (Smoyer-Tomic, 2003).
- Advocacy by the Public Health Authority for reduction of carbon emissions as part of a larger strategy supportive of the Kyoto Accord and for the lowering of airborne particle counts.
- Media pressure during summer 2001: the implementation of emergency measures by Toronto during a heat wave in August of that year (described above) led to questions as to why Montreal, in the grips of a similar heat wave, had not also opened cooling centers.

- The French heat wave of 2003 raised concerns another notch. Montreal, as the largest French-speaking city in North America, is particularly affected by what happens in Paris.

Fig. 1



Daily deaths in relation to reported temperature (°C, not humidity adjusted), Montreal (Canada), June 1994

As of 2003, Montreal's heat response plan included public warnings whenever an air temperature of 30 °C or more and an apparent temperature of 40 ° humidex or more were forecast, along with cooling measures such as prolonged opening hours for municipal swimming pools, and encouraging shopping malls to accommodate elderly patrons seeking respite from the heat. An informational pamphlet titled "Heat Waves are Deadly Serious" has been distributed to the public through pharmacies, doctors' consulting rooms, community health centers and hospitals. Authorities, both civic and public health, have been anxious to identify and apply a more "scientific" emergency response threshold and to add to those preventive and response measures already in place.

A joint program of action and research, initiated in 2003, involves the following components:

1. The identification of weather parameters associated with excess mortality employing both time-series and synoptic approaches. Based on this research, the action level for calling alerts will be re-evaluated for 2004 and modified if necessary, and a heat emergency action level will also be defined for the summer of 2005;
2. The expansion of health surveillance activities to include emergency ambulance transports, and calls to (telephone) Health Information and Help Lines, in order to establish early which segments of the population are being adversely affected by heat, and to gage impacts on their health;
3. Development of a geographic information platform to represent jointly the urban heat island differential across the City, differences in housing quality, and the proportion of the population by sector known to suffer from conditions (cardiovascular, respiratory, renal, etc.) which increase vulnerability to the effects of heat. The platform will serve as a means to identify priority sectors for intervention before and during heat emergencies, and to guide research;
4. Evaluation of air conditioner use, medication practices and patient hydration in chronic care centers;

5. Assessment of the knowledge, attitudes and practices of elderly and chronically ill persons on issues related to heat and its effects on health.

Priority actions were suggested on:
1. Integration of the emergency heat health response into Montreal's overall civil protection plan;
2. Advice on patient management for physicians and pharmacists;
3. A campaign designed to inform the general public about the effects of heat on health and appropriate preventive measures;
4. Development of social networks to support and protect isolated elderly and chronically ill persons;
5. Measures to marginally lower temperatures in non-air conditioned hospitals and chronic care centers where feasible;
6. Development of client-specific heat health management plans (optimal hydration and medication use, cool respite, danger signs).

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