

HEALTH EVIDENCE TO SUPPORT EXTENDED CONTINUOUS OPERATION OF DROP-IN SERVICES FOR HOMELESS PEOPLE DURING WINTER

Background

Cold weather can adversely affect the health and wellbeing of Toronto residents. Exposure to cold weather is known to increase the immediate risk of direct cold weather injuries such as hypothermia, frostnip, frostbite, chilblains, and trenchfoot. Cold weather can also increase the risk of mortality and hospitalizations for up to several weeks after exposure, especially for people with heart conditions. Those who are especially vulnerable to cold weather include people experiencing homelessness, people who work outdoors, the elderly, those with pre-existing heart conditions, and children.

A recent review provides detailed information about the health impacts of cold weather (Toronto Public Health 2014). However, at the time the review was completed, there were several areas where information was limited. In particular, information was lacking about the impacts of cold weather in the Toronto population, and on people experiencing homelessness in the City. Since then, local research resulted in new information which is specific to health impacts of cold weather on Toronto's population. These research efforts include:

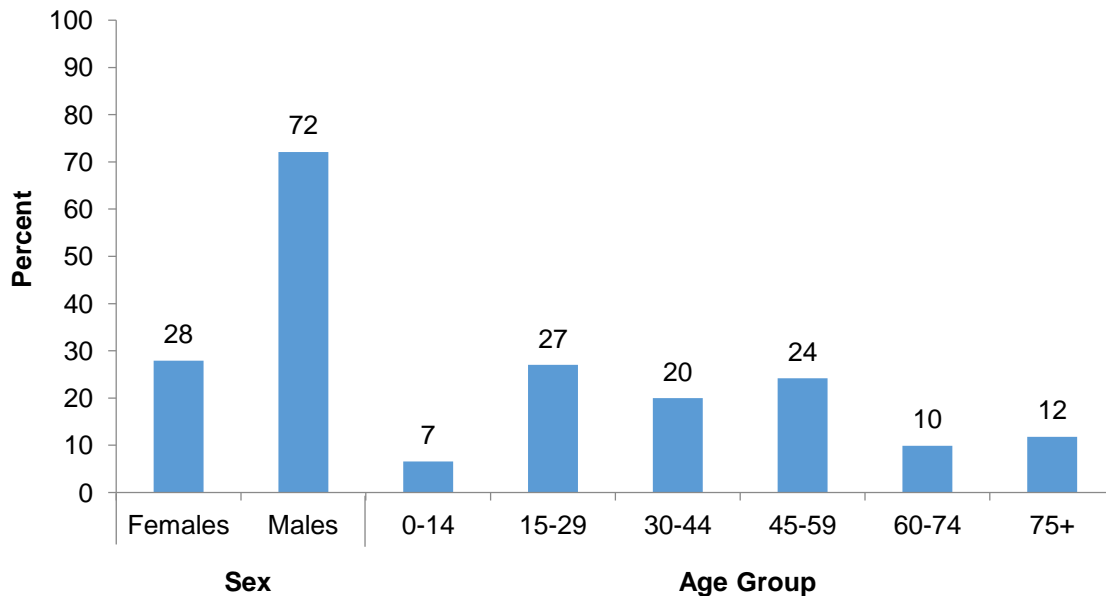
- a TPH-led analysis of emergency departments visits that occurred between 2006-2015 at all Toronto hospitals for cold-related injury including frostbite, hypothermia, trenchfoot, and chilblains. This analysis looks at who is most likely to suffer from cold-related injury and assesses the relationship between the emergency department visits and weather conditions;
- a chart review of emergency department visits that occurred between October 2004 and March 2015 for cold-related injury among people identified as being homeless for two Toronto hospitals: St. Michael's and Mount Sinai. This analysis also includes health impacts such as frostbite, hypothermia, trenchfoot, and chilblains, and assesses the relationship between emergency department visits and weather conditions. The project is a collaboration between TPH and the Centre for Urban Health Solutions (C-UHS) at St. Michaels' Hospital.
- interviews with 8 drop-in service providers and 40 drop-in clients who are homeless or under-housed. The objective of the project was to better understand the health impacts of extreme weather on Toronto's homeless population. This project is a collaboration between TPH, SSHA, and C-UHS, and was funded through a Healthier Cities and Communities Hub seed grant.

As well, academics and agencies including Public Health Ontario have recently released new research findings about the health impacts of cold weather. These findings include Canadian data and examine the links between cold weather and mortality and hospitalizations, which can occur for up to several weeks after exposure.

Findings

In general, people who visit emergency departments in Toronto for cold-related injuries are most likely to be between the ages of 15-59 (72% of visits), and are most likely to be male (72%) (see Figure 1).

Figure 1: Sex and Age Group of Toronto Residents who had a Cold-Related Emergency Department (ED) Visit during the Winter Season, 2006 to 2015



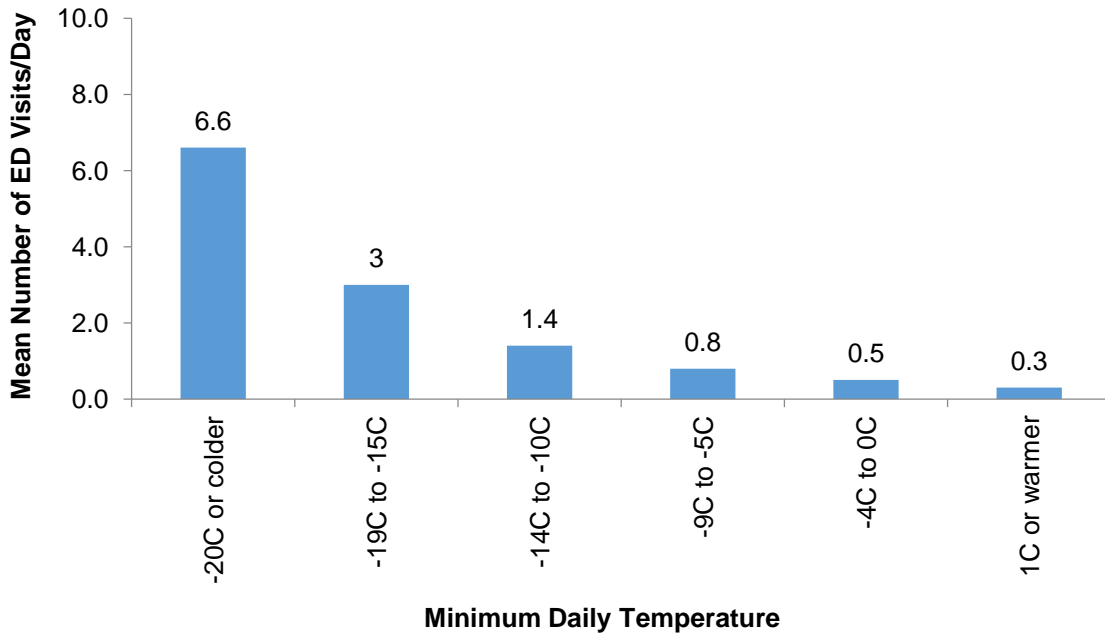
Notes: The analysis includes Toronto residents with an ED visit in Toronto, Peel, York Region, or Durham and who had at least one of the following cold-related diagnoses: frostbite, hypothermia, other effects of reduced temperature (e.g., trench foot, chilblains), or exposure to excessive natural cold. Only ED visits during the winter season were included in this analysis (November 15 - April 15).

Data Source: Emergency department visits: National Ambulatory Care Reporting System (NACRS) 2006 - 2015, Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: August 2016

Prepared by: Toronto Public Health

Figure 2 shows the average number of wintertime emergency department visits for cold-related injuries among Toronto's general population according to several temperature categories. The figure indicates that the coldest days are associated with the highest average number of cold-related injuries. For example, when the temperature was -20°C or colder, there were an average of 6.6 visits to the emergency department per day. The average number of emergency department visits drops off to 3 per day for temperatures between -15°C and -19°C , down even further to 1.4 for temperatures between -10°C and -14°C , and less than 1 visit per day for temperatures warmer than -9°C .

Figure 2: Mean Number of Cold-Related Emergency Department (ED) Visits per Day during the Winter Season among Toronto Residents by Minimum Daily Temperature, 2006 to 2015



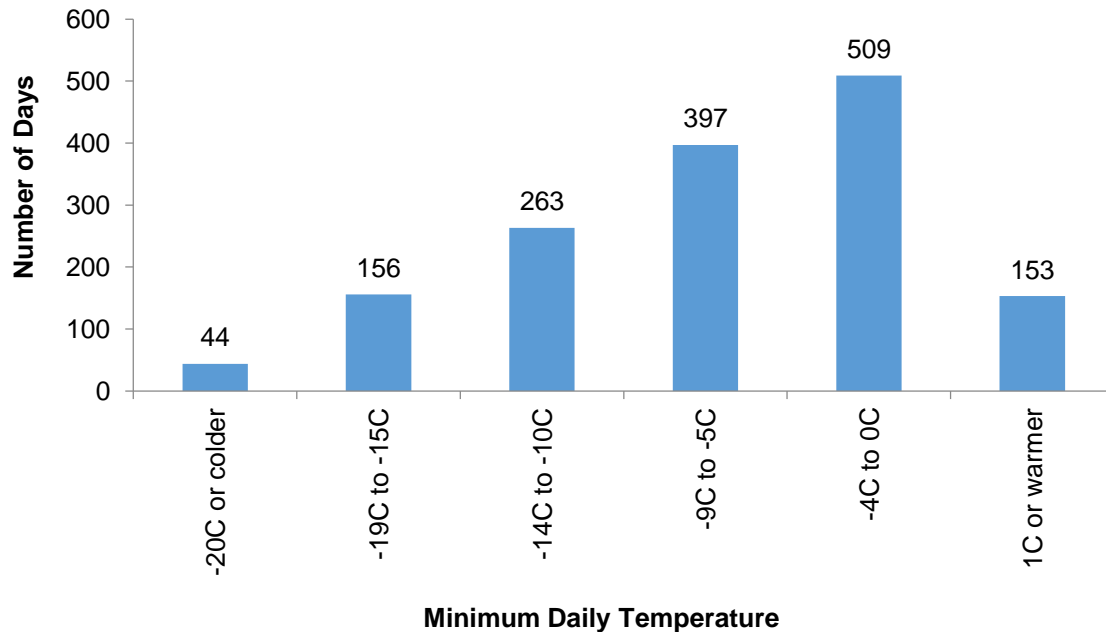
Notes: The analysis includes Toronto residents with an ED visit in Toronto, Peel, York Region, or Durham and who had at least one of the following cold-related diagnoses: frostbite, hypothermia, other effects of reduced temperature (e.g., trench foot, chilblains), or exposure to excessive natural cold. Only ED visits during the winter season were included in this analysis (November 15 - April 15). The numbers in the chart describe the mean number of ED visits per day when the minimum daily temperature on the current or previous day fell within each temperature category.

Data Source: Emergency department visits: National Ambulatory Care Reporting System (NACRS) 2006 - 2015, Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: August 2016

Prepared by: Toronto Public Health

While the highest risk from cold weather occurs on the coldest days, there are relatively few of these days during most Toronto winters. Environment and Climate Change Canada reports that in Toronto, average temperatures for December, January, and February are generally between about -7 °C and 0 °C. As Figure 3 shows, between 2006 and 2015 there were 44 days with temperatures of -20 °C or colder in Toronto while there were 509 days with temperatures between -4 °C and 0 °C.

Figure 3: Number of Days during the Winter Season by Minimum Daily Temperature, 2006 to 2015



Notes: Only days during the winter season were included in this analysis (November 15 - April 15). The numbers in the chart describe the number of days during the winter season between 2006 and 2015 where the minimum daily temperature on the current or previous day fell within each temperature category.

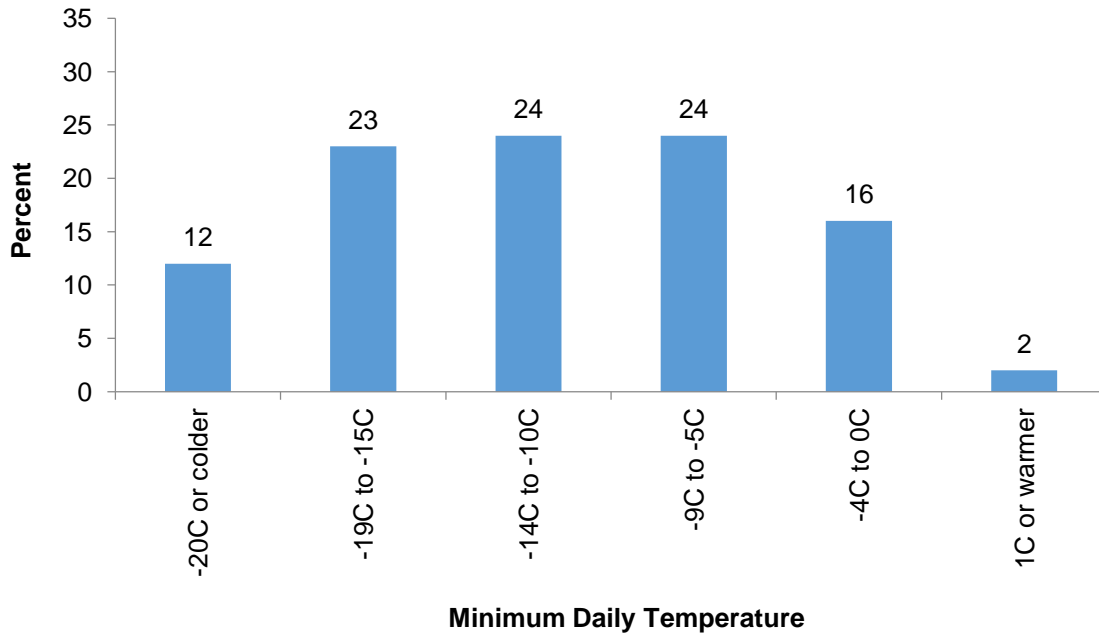
Data Sources: 1. Minimum daily temperature: Historical weather data from Toronto Pearson International Airport, 2006 - 2015, Environment Canada. Data for 2006 - 2014 downloaded June 2015. Data for 2015 downloaded February 2016.

Prepared by: Toronto Public Health

The result of this is that the relatively low risk of cold injury on each of those days compounds over time, giving rise to a relatively high health impact at the population level. Analysis of local data confirms that there are more visits to emergency departments for cold-related injury in Toronto on moderately cold days than occur on extremely cold days. For example, the analysis of data from emergency department visits for cold-related injuries among the general population in Toronto indicates that about 56% of visits occurred at temperatures warmer than -15 °C.

Because many cold weather response activities are targeted towards people experiencing homelessness as a particularly vulnerable population, it is helpful to consider how cold weather affects this group specifically. Figure 4 shows the pattern of emergency department visits by temperature category among a group of people experiencing homelessness in Toronto. The findings show that 66% of emergency department visits for cold-related injuries among this group occur at temperatures warmer than -15 °C.

Figure 4: Percent of Cold-Related Emergency Department (ED) Visits at St. Michael's Hospital and Mount Sinai Hospital by Minimum Daily Temperature among Homeless Individuals during the Winter Season, November 2004 to March 2015



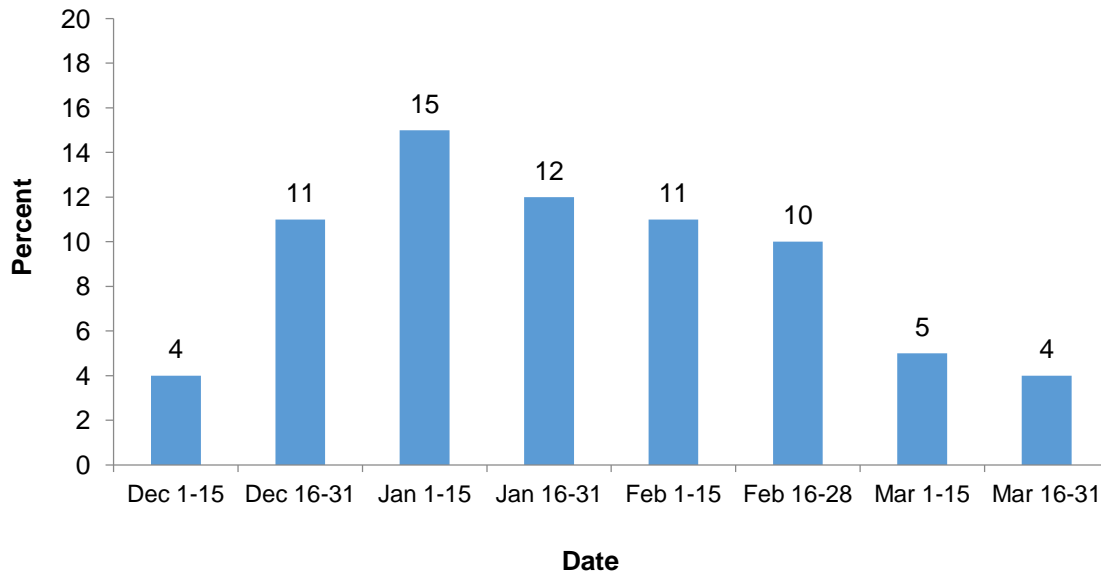
Notes: The analysis includes homeless individuals who had at least one of the following cold-related diagnoses: frostbite, hypothermia, and other effects of reduced temperature (e.g., trench foot, chilblains). Only ED visits during the winter season were included in this analysis (November 15 - April 15). The numbers in the chart describe the percent of ED visits when the minimum daily temperature on the current or previous day fell within each temperature category.

Data Sources: 1. Emergency department visits: Chart reviews of emergency department visits among homeless individuals at St. Michael's Hospital and Mount Sinai Hospital conducted by researchers at St. Michael's Hospital
 2. Minimum daily temperature: Historical weather data from Toronto Pearson International Airport, 2004 - 2015, Environment Canada. Data for 2004 - 2014 downloaded June 2015. Data for 2015 downloaded February 2016

Prepared by: Toronto Public Health

When planning cold weather response, it is also helpful to understand when services might be most needed by people experiencing homelessness. Figure 5 shows how cold-related injuries among people identified as being homeless and living in Toronto are distributed throughout the winter months of December to March. The figure indicates that the percent of emergency department visits among people identified as homeless is highest between mid-December and the end of February.

Figure 5: Percent of Cold-Related Emergency Department (ED) Visits in Toronto among Homeless Individuals by Date of the ED Visit, 2006 to 2015



Notes: The analysis includes homeless individuals living in Toronto who had an ED visit in Toronto, Peel, York Region, or Durham and who had at least one of the following cold-related diagnoses: frostbite, hypothermia, other effects of reduced temperature (e.g., trench foot, chilblains), or exposure to excessive natural cold. The analysis is based on cold-related ED visits occurring throughout the entire year, although the figure only presents partial results from December to March.

Data Source: Emergency department visits: National Ambulatory Care Reporting System (NACRS) 2006 - 2015, Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: August 2016

Prepared by: Toronto Public Health

In addition to analyzing the relationships between cold-related injuries and temperature in Toronto, it is useful to understand other ways in which cold weather might affect the health of people experiencing homelessness. Interviews with 40 clients and 8 service providers at Toronto drop-ins found that their health concerns also include anxiety and stress related to living in “survival mode” and worsening of other pre-existing health conditions. The study also found that dampness, rainy conditions, and temperature fluctuations substantially increased the impact of cold weather on health. Researchers also found that the population at the drop-ins includes more street-involved people during the winter, which may reflect the ongoing nature of challenges that the winter season creates for people who are homeless and under housed.

How the Evidence Informs Cold Weather Response in Toronto

Overall, the research indicates that both extreme and moderate cold can have important health impacts. The findings suggest that cold weather response in Toronto should have multiple components: 24-hour continuous drop-in services during the period of greatest health risk for those most vulnerable, alert-based response on extremely cold days as they occur, and messaging and actions to address health risks that persist throughout the winter.

Under Toronto's Cold Weather Response Plan, Extreme Cold Weather Alerts are issued when temperatures are forecast to reach -15°C or colder, or when the wind chill reaches -20 or colder.

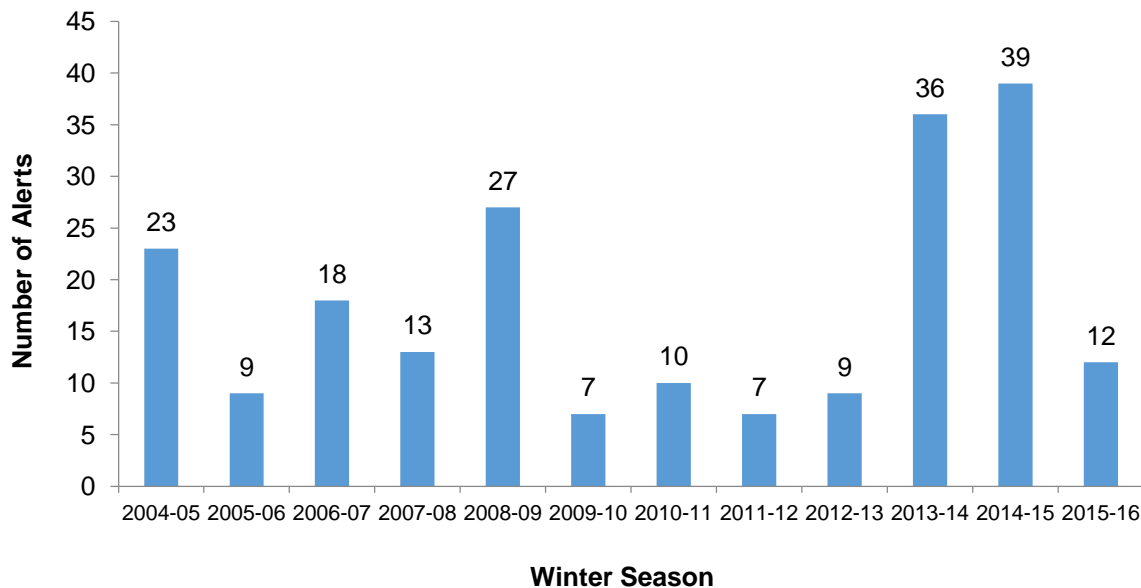
The Medical Officer of Health also takes into account current and expected weather conditions including precipitation, sudden cold, and low daytime temperatures. The intent of calling an alert is to:

- Warn people who are vulnerable to cold weather and their service providers and caregivers that such conditions are expected or already exist in the City;
- Urge vulnerable people to take measures to protect their health;
- Trigger response activities by City and community partners to protect vulnerable people within the city (e.g., enhance services).

The data show that days when Extreme Cold Weather Alerts are issued are indeed those that are likely to be associated with a higher risk of cold-related injury. Based on an Alert temperature threshold of -15°C , it appears that Alerts successfully target the days throughout the winter when the risk to health from cold weather is exceptionally high.

However, Extreme Cold Weather Alert days typically make up only a small number of the total wintertime days in Toronto. Also, as shown in Figure 6, the number of Extreme Cold Weather Alerts called varies from year to year. This further highlights the importance of considering the findings that a high number of cold-related injuries occur during moderately cold conditions in Toronto.

Figure 6: Annual Number of Extreme Cold Weather Alerts Since the Winter of 2004/2005



Prepared by: Toronto Public Health

The findings about the importance of moderate cold are not unique. A 2015 study of the association between temperature and all-cause mortality in 13 countries including Canada found that in all locations, the proportion of deaths attributable to extreme cold temperatures was substantially less than that attributable to milder temperatures. This finding was due to the higher number of days that are moderately cold in Canada (Gasparrini et al., 2015). Research led by Public Health Ontario and published in 2016 found that in Ontario, each 5 °C decrease in daily mean temperature was associated with approximately seven more non-accidental deaths per day in winter. The increased risk of death associated with cold weather was true even for temperatures close to 0 °C. The study found that cold weather is strongly linked to cardiovascular-related deaths, especially in people under 65 years of age, and that these effects lasted over several days (Chen et al., 2016). This year, Public Health Ontario also published findings that up to 10% of hospitalizations in Ontario for hypertension may be cold-related, with about 9% of those related to moderate cold (Bai et al., 2016).

Among people experiencing homelessness, there may be other health impacts that are related to winter conditions. Some are directly related to wintertime weather, including impacts from precipitation and dampness, while others are related to the stress of seeking shelter, or may be exacerbations of existing health problems. While some of these impacts are only indirectly related to cold weather, all persist throughout the cold weather season, constitute an additional health threat on top of the risk of cold-related injury, and can potentially be alleviated with access to appropriate supportive services.

It is important to ensure that vulnerable people have access to services throughout the cold weather season. The analysis completed for this report helps to define the high risk cold weather season for people experiencing homelessness in Toronto, with the data showing that the risk of cold-related injuries is elevated from mid-December through to the end of February.

The data has some limitations in that it underestimates the impacts of cold weather on the health of Toronto's general population, and on people experiencing homelessness. The analyses focus on visits to hospital emergency departments, but anyone who did not seek care for a cold-related health issue or who sought care from service providers outside of an emergency department such as a family practitioner, Telehealth Ontario, or a walk-in clinic would not be included in the dataset. Some cold-related health impacts are lagged by up to several weeks, and if it was not apparent to the attending emergency room physician that cold contributed to a delayed health outcome such as a heart attack, the patient would not be captured in the analysis. As well, the chart review component includes only two hospitals, and many people experiencing homelessness may choose to avoid emergency departments even if they have a cold-related injury. Despite these challenges, the pattern of visits associated with different weather conditions provides important information about the relative burdens of weather conditions on this group of homeless individuals.

Conclusion

The health evidence suggests that cold weather response in Toronto is best delivered through a combination of alert-based services with seasonal services. For people experiencing homelessness, the data suggests that offering seasonal response services such as continuous 24-hour drop-ins between mid-December and end of February will provide a substantial health benefit.

References

Bai et al. 2016. Hospitalizations from Hypertensive Diseases, Diabetes, and Arrhythmia in Relation to Low and High Temperatures: Population-Based Study. *Scientific Reports*. 6: 30283. DOI:10.1038/srep30283

Chen et al. 2016. Assessment of the effect of cold and hot temperatures on mortality in Ontario, Canada: a population-based study. *CMAJ Open*. 4(1): E48-E58. DOI:10.9778/cmajo.20150111

Gasparrini et al. 2015. Mortality risk attributable to high and low ambient temperature: a multicountry observational study. *Lancet*. 386(9991):369–375. DOI: [http://dx.doi.org/10.1016/S0140-6736\(14\)62114-0](http://dx.doi.org/10.1016/S0140-6736(14)62114-0)

Toronto Public Health. 2014. Health Impacts of Cold Weather. Available from www.toronto.ca/reports