



**STAFF REPORT
ACTION REQUIRED**

Preventing Injuries from Wintertime Slips and Falls in Toronto

Date:	October 14, 2016
To:	Board of Health
From:	Acting Medical Officer of Health
Wards:	All
Reference Number:	

SUMMARY

Walking is a healthy, environmentally-friendly behaviour linked to a lower risk of heart disease, obesity, type II diabetes, certain types of cancer, and mortality. The presence of snow and ice on sidewalks may discourage residents from walking in the wintertime, lead to isolation in older adults, and reduce equity of access to opportunities for physical activity and transportation. Between 2006 and 2015, there were almost 30,000 emergency department visits and 2,800 hospitalizations among Toronto residents from falls on snow or ice, and older adults were especially vulnerable. These injuries cost the provincial healthcare system close to \$4,000,000 per year. Slips and falls on snow or ice also cost the city about \$6,700,000 per year as a result of liability insurance claims. Indirect societal and direct and indirect personal costs add to the burden from wintertime slips and falls.

Annual rates of emergency department visits, hospitalizations, and liability insurance claims related to slips and falls on snow and ice all closely mirror annual snowfall amounts. While keeping sidewalks clear of snow and ice is likely to reduce the risk of slips and falls, the type and level of sidewalk snowclearing varies across the City. Ways to encourage walking as part of a safe, healthy wintertime lifestyle include enhancing efforts by Transportation Services to target and clear sidewalks in areas of the city with high pedestrian volumes and seek opportunities for improvement in areas that currently do not receive mechanical snowclearing through technology, enforcement, and resident education. Tracking claims data over time and producing an accessible, online map of areas where sidewalks are currently mechanically cleared would further support efforts to reduce injuries related to slips and falls on snow and ice in the future.

RECOMMENDATIONS

The Acting Medical Officer of Health recommends that:

1. The Board of Health request the Acting Medical Officer of Health to work with the General Manager of Transportation Services to explore opportunities to improve sidewalk safety during the winter months, including:
 - a. changing the snowfall threshold for sidewalk clearing to 2 cm in all areas where mechanical sidewalk clearing is available;
 - b. collaborating with the Director of Insurance and Risk Management to improve the data quality of claims against the City to track claims over time for the purposes of assessing whether increases in snow removal to high volume pedestrian areas result in reduced claims;
 - c. producing and keeping up to date an online, publicly available map that clearly defines areas that receive sidewalk snow and ice clearing services in the City of Toronto;
 - d. increasing awareness of existing programs to help older adults and those with disabilities who are unable to clear their own sidewalks, in areas where sidewalks are not cleared by the City of Toronto;
 - e. increasing resident awareness of their responsibilities related to clearing snow from sidewalks adjacent to their properties;

2. The Board of Health forward this report to:
 - a. the Public Works and Infrastructure Committee for their information;
 - b. the iDAPT Centre for Rehabilitation Research, Walk Toronto, Sick Kids Hospital, the Ministry of Health and Long-Term Care (MOHLTC), Parachute, the Public Health Agency of Canada (PHAC), the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP), the Toronto District School Board (TDSB), the Toronto Catholic District School Board (TCDSB), the French school boards, CARP (formerly the Canadian Association of Retired Persons) , Women's College Hospital, the 5 Toronto LHINs, the Seniors Accountability Table, and the Toronto Seniors' Forum.

Financial Impact

There are no financial implications arising from the adoption of this report.

DECISION HISTORY

On October 26, 2015, the Board of Health adopted the report *Update on Toronto's Cold Weather Protocol*, which reviewed emerging information about the impact of cold weather on health and described updates to Toronto's *Cold Weather Plan*. It also introduced the link between cold weather and slips and falls.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.HL7.3>

ISSUE BACKGROUND

Walking is a healthy behaviour linked to a lower risk of heart disease, obesity, type II diabetes, certain types of cancer, and mortality¹. Walking also alleviates stress, improves sleep, increases energy, helps in achieving or maintaining a healthy weight, and lowers cholesterol and blood pressure. As well, walking generates significant social, environmental, economic and transportation system benefits. Toronto Public Health (TPH) and other agencies promote walking as an easy, accessible, and economical way to stay healthy.

However, walking can be more challenging in the winter than in the summer. Accumulation of snow and ice on sidewalks decreases walkability and increases the likelihood of injury associated with slips and falls. When sidewalks become partly or fully snow-covered, they require additional effort to walk on. They can be especially difficult to navigate for people with strollers or assistive devices, and for people who are frail or face physical challenges due to age or disability. For some who decide to walk despite difficult conditions, a slip and fall can result in injuries requiring medical follow-up. All of these factors reduce the likelihood that people will choose to walk as a means of transportation or for physical activity.

COMMENTS

Health Impacts

The presence of snow and ice can reduce the known health benefits associated with walking. Walkability is a measure of how easy and safe walking is in a particular area. In 2012, TPH reported on findings that people living in walkable neighbourhoods in Toronto do more utilitarian walking, take transit more often, drive less often and less far, and have lower body weights, than those who live in less walkable neighbourhoods². These results suggest that people living in more walkable neighbourhoods in Toronto are more physically active than those who live in less walkable neighbourhoods.

The presence of snow and ice on sidewalks reduces walkability. A recent Toronto study found that 27% of participants overall and 56% of older participants had trouble moving around outdoors, in the winter, with 47% of participants identifying sidewalks as their greatest concern³. The problems most frequently cited with sidewalks were icy surfaces (81%), snow banks (70%), or snowy/slushy surfaces (69%). As well as reducing opportunities for physical activity, low walkability can lead to social isolation for people who cannot go out. The same Toronto study found that, when there was snow or ice on the ground, over 40% of those aged 35-59 years and 60% of those aged 60-85 years said that they would go out less as a way to cope with the weather³. In a separate Toronto survey, 38% of residents overall and 44% of those aged 65 and older said that better snow removal/winter maintenance would encourage more walking⁴. In addition to older adults, there may be other groups who also experience isolation when snow and ice make walking more difficult, including parents who use strollers and people who have pre-existing illnesses or require assistive devices.

When snow and ice reduce walkability, they may also affect equity of access to opportunities for physical activity and transportation. Walking is a form of physical activity that is accessible to almost everyone including people of different ages and abilities. It is easy to do and does not require specialized equipment. There are also people who do not have alternatives to walking for transportation to accomplish their daily activities. This may include older adults as well as those with lower incomes. In one U.S. study, the main reason for walking among older adults living in socioeconomically deprived neighbourhoods was for utilitarian purposes⁵, and these adults already had higher rates of falls than other groups, suggesting that they had little choice about facing outdoor hazards when walking.

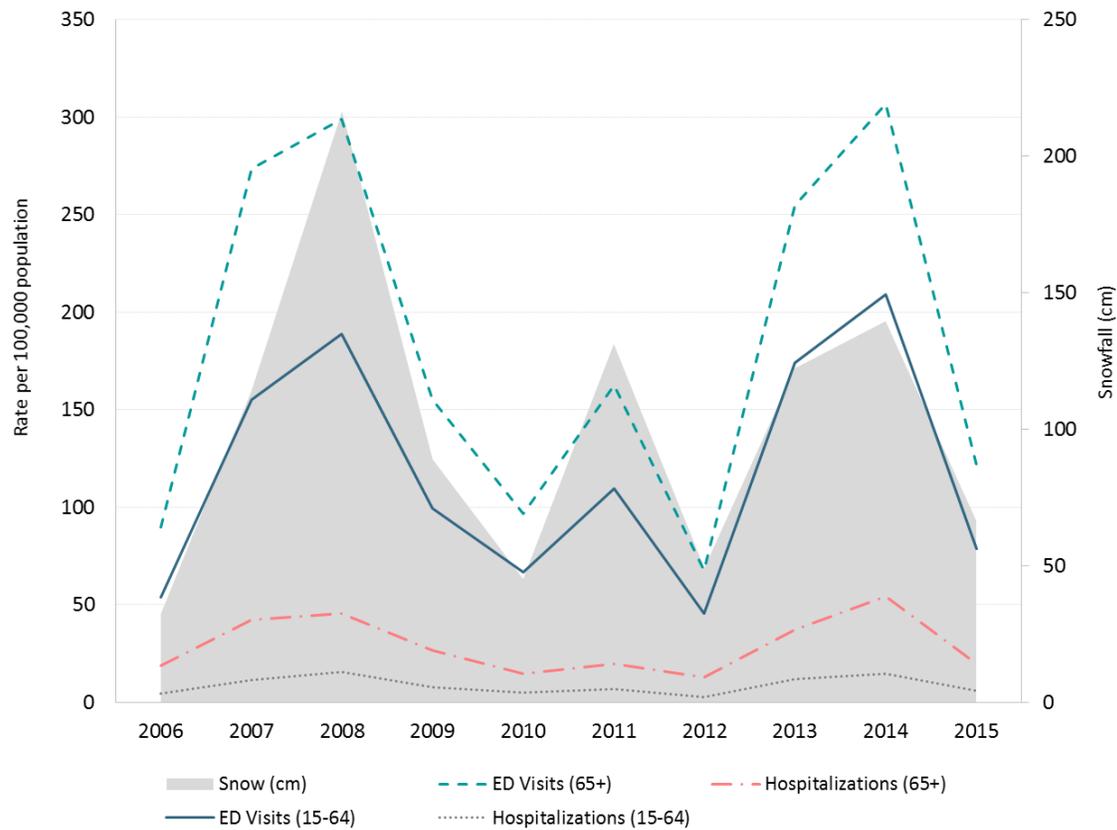
Burden of Illness from Slips and Falls on Snow or Ice in Toronto

The burden of illness from slips and falls on snow or ice is significant. A new analysis conducted by TPH of Toronto residents aged 15 years and older found that there were almost 30,000 emergency department visits and 2,800 hospitalizations from falls on snow or ice between 2006 and 2015. The median age of people who visited emergency departments was 51 years, and the median age of those who were hospitalized was 59 years. Among those visiting emergency departments, most falls were considered urgent or potentially serious (46%) or semi-urgent (45%), with about 8% considered life-threatening. In the emergency department, injuries most often affected the knee and lower leg (18% of all injuries), head (17%), or the elbow and forearm (17%). Among people who fell on snow or ice and were hospitalized, the average stay was six days, with injuries affecting mainly the knee and lower leg (46%) or the hip and thigh (21%).

Multiple factors can contribute to a person slipping, falling and injuring themselves, including footwear, the type of surface underfoot, the level of friction between footwear and the ground, biomechanics of a person's walk including muscle strength, posture, balance, and stride length, physiological characteristics such as presence of illness, unsafe behaviour, and environmental factors such as temperature and snowfall⁶. The presence of snow and ice is known to increase the risk of slips and falls among people who regularly use sidewalks. For example, a UK study of postal workers found that ice and snow were involved in 63% of slipping accidents, and that the highest incidence of slip and fall accidents occurred in the months of November-February⁷.

The importance of snowfall for slip and fall injuries in Toronto is clearly illustrated in Figure 1. The figure shows that annual rates of emergency department visits and hospitalizations from falls on snow and ice among Toronto adults closely mirror annual snowfall amounts.

Figure 1: Emergency Department (ED) Visit and Hospitalization Rates for Falls on Snow or Ice per 100,000 population in Toronto, 2006 to 2015



Notes: Analysis restricted to winter months (November 1 to April 30). ICD-10 W00 – Falls on the same level involving snow or ice.

Data Sources: ED Visits - National Ambulatory Care Reporting System; Hospitalizations – Discharge Abstract Database, 2006 to 2015, Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: June 2016. Snowfall – Environment Canada Historical Weather Data 2006 to 2015.

Figure 1 also illustrates that among residents of Toronto, older adults are most vulnerable to falls on snow or ice. The figure shows that rates of emergency department visits and hospitalizations related to slips and falls on snow or ice are higher among those who are 65 years and over than among those aged 15 to 64 years for each year from 2006 to 2015. This is consistent with research conducted elsewhere: similar analyses in the UK found that rates of emergency hospital admissions due to falls on snow and ice were highest among the elderly, and especially among those over 80 years⁸, analyses in Montreal found that rates of fall-related injuries among those 65 and older increased in association with both freezing rain alerts and snowstorm alerts⁹, and analysis of Canadian Community Health Survey data found that walking on snow or ice was the second-most common reason for falls among older adults¹⁰. Among older adults, changes in gait pattern, strength, vision and balance are common. When combined with unstable and slippery walking surfaces, an increased risk of falls in the winter is expected¹¹.

It is important to note that this analysis captures a subset of slips and falls on snow or ice that occurred in Toronto - those resulting in the most severe injuries. Anyone who fell and subsequently visited their doctor or a walk-in clinic, or tended to their injuries on their own, would not be included in this analysis. Typically, these less severe injuries are more common, meaning that the actual burden of illness from slips and falls on snow and ice is greater than what is described above.

Economic Burden of Illness

In addition to the burden on health, injuries due to slips and falls are costly to the economy.

Costs related to care of the injured person

Sustaining an injury leads to costs from emergency department care, hospital admissions, or visits to doctors. These costs accrue mainly to the provincial government. According to the Ontario Case Costing database¹², in the 2014/2015 fiscal year, emergency department visits from falls on snow or ice in Toronto cost an average of about \$330 per visit, including one emergency department physician consultation. Costs related to hospitalizations are more difficult to calculate. For the fiscal year 2014/2015, the Ontario Case Costing database indicates that acute inpatient costs from falls on snow or ice averaged about \$10,000 per hospitalization. However, this amount does not include physician costs, which add at least \$60 per day plus an additional cost of \$150-\$200 if the patient requires a specialist consultation during their stay - such as orthopaedics, neurology or geriatrics.

Between 2006 and 2015 the average annual number of emergency department visits by Toronto residents age 15 years and older for slips and falls related to snow and ice was about 3,000. While cost information fluctuates from year-to-year, applying the estimates from 2014-2015 provides a general sense of the magnitude of potential costs from slips and falls. Using 2014-2015 cost data suggests that emergency department costs could average about \$990,000 per year. Between 2006 and 2015, the average annual number of hospitalizations related to slips and falls on snow and ice was about 280, suggesting an average annual cost of \$2,800,000. Together, these costs total close to \$4,000,000. This value is likely a significant underestimate of the true costs of these injuries to Ontario's healthcare system. In addition to excluding costs from specialist consults in hospital, it also excludes costs arising from visits to family doctors or walk-in clinics, which are difficult to estimate.

Costs arising from legal claims against the City of Toronto

The City of Toronto has a responsibility to keep its infrastructure in a safe state. People who injure themselves from a fall and believe that the City has been negligent in its maintenance of City facilities, including sidewalks and roads, may file a legal claim against the city, requesting money to offset damages. These costs accrue to the City and may be a combination of settlement costs (including damages, interest, court ordered judgements) as well as expenses related to the claims process (such as legal fees, claims adjuster fees, and defence expert costs). TPH analyzed claims data provided by the City's Insurance and Risk Management section of Corporate Finance Division. Between 2006

and 2015 there were a total of 2,300 claims against the City that occurred as a result of a sidewalk slip and fall on a snowy or icy sidewalk between the months of November 1 to April 30, with a total incurred cost of just under \$67 million. The annual number of claims between 2006 and 2015 closely mirrors annual snowfall amounts, in a pattern very similar to annual emergency department visits.

Indirect costs to society and costs to the injured person

An indirect economic burden on the community when someone is injured arises from losses due to goods and services that are not produced as a result of the impairment. While it is difficult to estimate the value of time lost from work and homemaking due to morbidity, disability, and premature mortality, it is reasonable to assume they would be substantial for cases of severe injury.

The impact of a slip and fall injury on an individual varies depending on the severity of the injury and its implications for a person's ability to function day-to-day, including their ability to work, care for others, and participate in their life as normal. While some costs such as lost wages are easy to identify, others such as pain and suffering, economic dependence, and social isolation are much more difficult to estimate.

Keeping Toronto's Sidewalks Safe and Accessible in Winter

Keeping sidewalks clear of snow and ice is likely the best way to reduce the risk of slips and falls in the winter. In many parts of the City, sidewalks are plowed after significant snowfalls. In most areas of the former Etobicoke, North York, and Scarborough, the Transportation Services Division of the City uses mechanical sidewalk snowclearing between December and March; in these areas, snow is mechanically cleared after 8 cm of snowfall. Starting in 2015, high volume pedestrian areas such as arterial roads, transit routes, and school zones are mechanically cleared following 2 cm of snowfall.

Transportation Services may also apply de-icing compounds and sand to sidewalks following mechanical clearance.

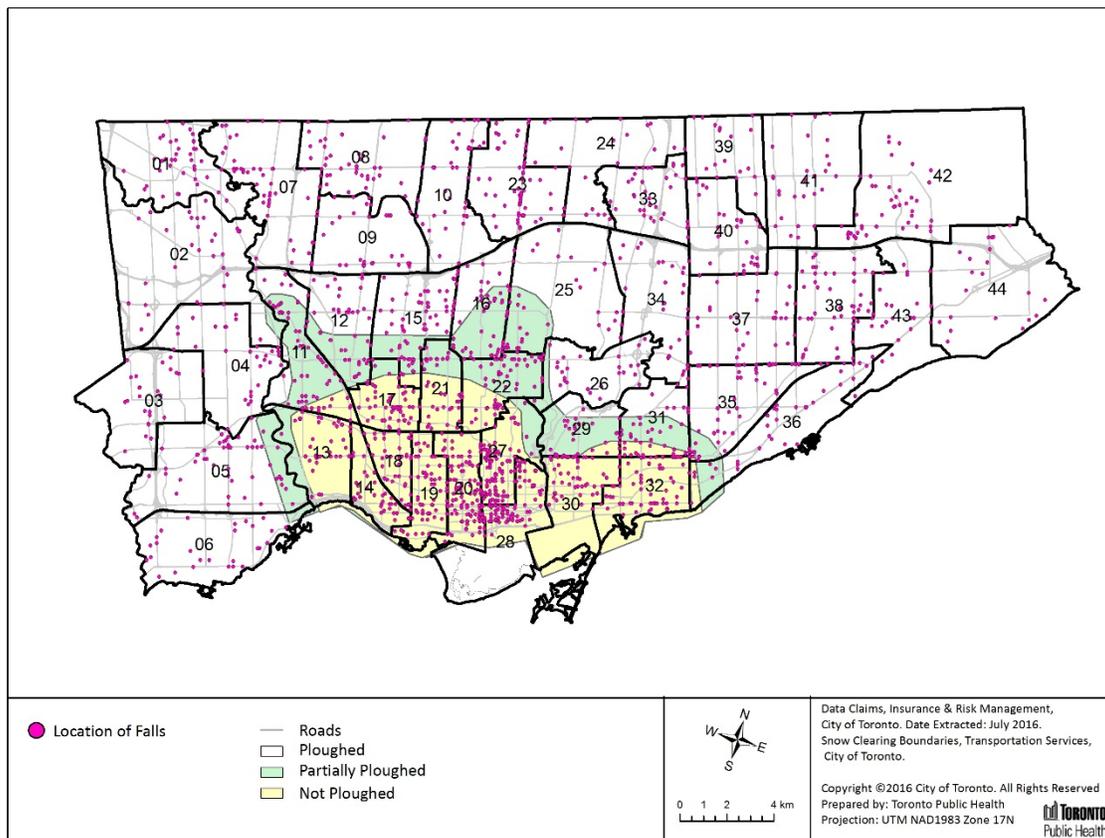
In the former City of Toronto, York, and East York, although many main routes are mechanically cleared by the City, sidewalks on local roads are not mechanically cleared. These local "downtown" sidewalks are more difficult to clear because they are narrow, have more encroachments, street furniture and other obstructions that prevent equipment from passing through freely, and on-street parking limits equipment maneuverability and snow storage capacity. According to Transportation Services, about 1,100 km of sidewalks are not mechanically cleared (out of a total of 7,100 km of sidewalk in Toronto). In areas without mechanical snowclearing, Municipal Code Chapter 719 requires owners or occupants to clear sidewalks next to their property within 12 hours after any snowfall. Transportation Services offers free manual sidewalk snow clearing services to older adults and people with disabilities who live in these areas and register with the City.

Challenges arise when snow accumulates on sidewalks rather than being cleared away. Over time, the snow can become compacted and icy, making it very difficult to walk. This is most likely to occur in the areas of the former City of Toronto and East York,

which do not have mechanical snow clearing. These are also the areas of the City that typically have higher pedestrian volumes, meaning that high numbers of people are affected by poor sidewalk conditions. However, these conditions can also arise on sidewalks in areas that normally receive mechanical snowclearing if the 8 cm minimum snowfall amount is not met and property owners do not clear the sidewalks.

Figure 2 shows the areas which receive full, partial, or no snow clearing of sidewalks on local roads. The figure also shows the locations associated with claims against the City for injuries arising from falls on snow or ice between 2006 and 2015. Many of the falls occur in the downtown area, which tends to have the most pedestrians, and is also the least likely to have snow cleared. However, the figure also shows that falls occur across the city, suggesting that efforts to improve snowclearing in all areas of the City could have substantial benefits for physical activity and injury reduction.

Figure 2: Locations of Falls on Snow or Ice that Resulted in a Claim Against the City of Toronto between 2006-2015, and Areas of the City Which Receive Varying Levels of Mechanical Sidewalk Snowclearing Service



Data Sources: Claims Data, Insurance & Risk Management, City of Toronto. Date Extracted: July 2016. Snowclearing Boundaries, Transportation Services, City of Toronto.

In other jurisdictions across Canada, sidewalk snowclearing practices vary. Some cities including Montreal, Ottawa, Quebec, and Burlington offer full service, with all sidewalks cleared throughout the city. In others, such as Sudbury, Halifax and St. John's, varying

amounts of the total sidewalk length are cleared by the city, with priority given to those in downtown areas, along major arterials, and close to schools. In many cities across Canada, the city clears only those sidewalks adjacent to city-owned or high priority properties such as schools and bus stops, with the remainder of sidewalk snowclearing being the responsibility of the property owner or occupant. Transportation Services found similar information when they reviewed practices in other municipalities in 2014 (<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2014.PW31.1>).

Current Efforts in Wintertime Falls Prevention

Currently, Transportation Services offers free manual sidewalk snow clearing services to those over 65 years old and to people with disabilities who register with the City. This covers sidewalks adjacent to their property but not driveways or pathways leading up to the residence. While there are about 400,000 older adults in Toronto, Transportation Services indicated in 2016 that only about 7,000 people receive this service.

When property owners in areas that do not receive mechanical sidewalk snowclearing do not clear their sidewalks, the City has authority to clear the sidewalks and add the resulting costs to the Realty Tax bill of the property. Current By-law enforcement for failure to remove snow or ice is primarily a complaint-driven process. To improve enforcement, Transportation Services is seeking funding in the 2017 budget to increase the number of bylaw officers available to respond to concerns about uncleared sidewalks. Transportation Services is also working with researchers at the Toronto Rehabilitation Institute to explore features of intersection design that may reduce the risk of falling related to snow and ice.

TPH offers education sessions to service providers and caregivers of older adults on fall prevention aimed to increase awareness of the risks for falling and how to reduce these risks. As well, initiatives to promote physical activity and healthy eating for adults in the community inform participants about protective factors that prevent falls throughout their adult life and offer them information on how to plan a walk. In 2016, TPH launched activeTO.ca which provides information about free and accessible physical activities in Toronto and includes safety tips for walking.

At the Toronto Rehabilitation Institute, efforts are underway to develop an evidence-based rating system for outdoor winter footwear that would be available for consumers online at www.ratemyreads.com. The rating system would allow consumers to evaluate potential footwear options in terms of ability to prevent slips before purchasing a new pair of winter boots. As part of their Falls Prevention Month education and outreach activities in November 2016, the Institute will also offer the public an opportunity to test the slip resistance of their own footwear on ice and snow.

Next Steps in Reducing Injuries from Slips and Falls on Snow and Ice

Improved snowclearing on sidewalks has multiple potential benefits including reduced injury, reduced costs to the taxpayer, and improved physical and mental health by enabling people to walk regularly. In areas where mechanical snow clearing is possible, it would be beneficial to explore whether all sidewalks could be cleared after 2 cm of

snowfall, rather than clearing some areas after 2 cm and waiting until after 8 cm have fallen for others. While previous investigations by Transportation Services were unable to identify equipment that would enable mechanical clearing in many areas of the former City of Toronto and East York, technology can evolve quickly. It will be important to actively monitor evolving technology to identify new options that become available to facilitate sidewalk clearing or snow removal in all areas of the City, as well as monitoring practices for sidewalk clearing in other cities with older cores and narrow sidewalks.

Ensuring awareness of the City's program to clear sidewalks for those who are elderly or disabled will support independence and good health among these groups. Building on current communications about the program to target these groups in particular will aid in uptake by those who will benefit from the program the most.

As changes to sidewalk snowclearing practices are implemented, it is important to monitor data about injuries in the City, including claims data, to determine whether the numbers and costs of falls on snow and ice change over time as interventions are implemented. As well, the map currently provided to the public identifying areas where sidewalks are mechanically cleared is difficult to read and the pdf format does not support any type of analysis. Offering an accessible map in a format that can be used in association with geographic information system (GIS) software would support other City divisions and interested members of the community to better understand slips and falls on snow or ice.

Reducing slip and fall injuries from ice and snow in Toronto will continue to require attention to effective service delivery, and can be supported by monitoring and building on available data about patterns and drivers of slip and fall injuries from snow and ice in the City. Such efforts have the potential to yield important health and economic benefits.

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References

1. Toronto Public Health. *Road to Health: Improving Walking and Cycling in Toronto*. 109 (2012).
2. Toronto Public Health. *The Walkable City: Neighbourhood Design and Preferences, Travel Choices and Health*. 58 (2012).
3. Li, Y., Hsu, J. A. & Fernie, G. Aging and the Use of Pedestrian Facilities in Winter—The Need for Improved Design and Better Technology. *J. Urban Health Bull. N. Y. Acad. Med.* **90**, 602–617 (2013).
4. City of Toronto. *Wayfinding Survey Draft Report*. (2016).
5. Li, W. *et al.* Utilitarian Walking, Neighborhood Environment, and Risk of Outdoor Falls Among Older Adults. *Am. J. Public Health* **104**, e30–e37 (2014).
6. Gao, C. & Abeysekera, J. A systems perspective of slip and fall accidents on icy and snowy surfaces. *Ergonomics* **47**, 573–598 (2004).
7. Bentley, T. A. & Haslam, R. A. Identification of risk factors and countermeasures for slip, trip and fall accidents during the delivery of mail. *Appl. Ergon.* **32**, 127–134 (2001).
8. Beynon, C. *et al.* The cost of emergency hospital admissions for falls on snow and ice in England during winter 2009/10: a cross sectional analysis. *Environ. Health* **10**, 60 (2011).
9. Mondor, L., Charland, K., Verma, A. & Buckeridge, D. L. Weather warnings predict fall-related injuries among older adults. *Age Ageing* **44**, 403–408 (2015).
10. Do, M. T., Chang, V. C., Kuran, N. & Thompson, W. Fall-related injuries among Canadian seniors, 2005-2013: an analysis of the Canadian Community Health Survey. *Health Promot. Chronic Dis. Prev. Can. Res. Policy Pract.* **35**, 99–108 (2015).
11. Government of Canada, P. H. A. of C. Seniors' Falls in Canada: Second Report - Public Health Agency of Canada. (2014). Available at: http://www.phac-aspc.gc.ca/seniors-aines/publications/public/injury-blessure/seniors_falls-chutes_aines/index-eng.php. (Accessed: 19th September 2016)
12. Ontario Ministry of Health and Long-Term Care. Ontario Case Costing database. (2016).