TORONTO

# STAFF REPORT
# ACTION REQUIRED

# Update on Extreme Heat and Maximum Indoor Temperature Standard for Multi-unit Residential Buildings

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| **Date:** | November 16, 2015 |
| **To:** | Board of Health |
| **From:** | Medical Officer of Health |
| **Wards:** | All |
| **Reference Number:** | |

## SUMMARY

This report provides an update on a request from the Board of Health to report on whether a maximum indoor temperature for rental apartment units is needed, and if so to identify an appropriate temperature.

New evidence indicates that exposure to temperatures above 26°C is associated with increased premature mortality and emergency medical services calls. Based on the available health information to date, there is a need to better protect residents from extreme heat, and the feasibility of implementing a health-based maximum indoor temperature standard of 26°C for rental multi-unit residential buildings should be explored.

A maximum indoor temperature standard is one component of a multi-pronged approach to reducing the health risk to vulnerable populations from extreme heat in multi-unit residential buildings. This report also summarizes the planned approach by Toronto Public Health (TPH) and Municipal Licensing and Standards (MLS) to engage tenants, landlords, technical experts and other stakeholders on this issue, as directed by the Board of Health. The report was prepared in consultation with MLS.

## RECOMMENDATIONS

**The Medical Officer of Health recommends that:**

1. The Medical Officer of Health, in collaboration with the Executive Director of Municipal Licensing and Standards, and in consultation with stakeholders, explore the feasibility of implementing a health-based maximum indoor temperature standard of 26$^{o}$C for rental multi-unit residential buildings and report back to the Board of Health.

2. The Board of Health forward this report to the Tenant Issues Committee.

### Financial Impact

The recommendations have no financial impact beyond what has already been approved in the current year's budget.

## DECISION HISTORY

On July 26, 2011, the Board of Health adopted the report, "Protecting Vulnerable People from Health Impacts of Extreme Heat" (HL6.3). The report provided an extensive review of the health impacts of extreme heat, described the need for tenants in high-rise apartments to have access to cooling areas and advocated for policy options at the provincial and local levels.

On July 8, 2014, City Council adopted the report, "Strategies to Prevent Heat-Related Illness and Deaths from Extreme Heat Emergencies" (HL32.2), which outlined strategies to strengthen Toronto's preparedness for heat emergencies and increase access to cool spaces for heat-vulnerable populations.

On June 29, 2015, the Board of Health adopted the report, "Reducing Health Risk from Extreme Heat in Apartment Buildings" (HL5.5). The Board directed TPH staff to consult widely and assess the feasibility of specific strategies to increase access to cooling for residents of multi-unit residential buildings. The strategies include a maximum indoor temperature standard, on-site cooling centres at multi-unit residential buildings, tenant and landlord engagement, a vulnerable residents list and advocacy regarding the Ontario Building Code.

The Board of Health requested the Medical Officer of Health to report to the Board of Health and Tenant Issues Committee on whether a maximum indoor temperature for apartment units is needed, and if so to identify an appropriate temperature.

## ISSUE BACKGROUND

The health impacts of extreme heat include heat stress, heat stroke, morbidity and mortality. People who experience high temperatures for prolonged periods, or are sensitive to heat, are the most vulnerable. In Western Europe in 2003, heat waves of exceptional intensity and duration were associated with 70,000 premature deaths.[1] In 1995, a Chicago heat wave was associated with at least 700 premature deaths.[2]

The impacts of heat are disproportionately borne by frail, elderly and isolated people. People experiencing low incomes are at higher risk of heat impacts, likely due to poorer quality housing, limited access to air conditioning, and the increased likelihood that they suffer from pre-existing illness.[3] For all members of the population, indoor temperature can have a substantial impact on health and well-being, with people in developed nations spending up to 90% of their time indoors.[4]

Earlier this year, TPH and MLS began engaging tenants, landlords, technical experts and other stakeholders on ways to address extreme heat in multi-unit residential buildings. TPH commissioned a review of building technology options, and collaborated with MLS to host a March 2015 expert roundtable to discuss appropriate solutions for Toronto. The findings from this preliminary work are summarized in the June 2015 Board of Health report entitled "Reducing Health Risk from Extreme Heat in Apartment Buildings" (HL5.5).

The long-term goal is to have safe, comfortable temperatures in all apartment building units. To achieve this goal, one approach being explored is establishing a health-based maximum indoor temperature standard for rental multi-unit residential buildings, as described in this report.

## COMMENTS

### Maximum Indoor Temperature Standards

To date, recommended maximum indoor temperature standards have been developed primarily based on thermal comfort levels. Thermal comfort levels have generally been developed by building and engineering industries and are based on comfort thresholds for 80% of individuals occupying office environments. The Canadian Standards Association recommends maintaining office temperatures below approximately 26°C under conditions of typical relative humidity (CAN/CSA Z412-00).[5] Thermal comfort is important for health and well-being. An environment that is too warm can result in people feeling tired and uncomfortable which may impact their well-being and quality of life. However, a limitation of these standards is that thermal comfort is subjective and influenced by several factors, including clothing, activity level, metabolic rate, age and pre-existing medical conditions. As well, thermal comfort temperatures may not reflect the temperatures at which people experience health impacts from heat. From a health perspective, it is important that any maximum indoor temperature standard considers health-based evidence rather than comfort thresholds alone.

Reports by the World Health Organization (WHO) provide guidance on thermal comfort and suggest that there is minimal risk to health when indoor temperatures are between 18°C and 24°C.[6,7,8] This temperature range is based on research examining the health impacts of temperature for healthy individuals under conditions of appropriate clothing, humidity and air movement (i.e. not under high winds). The temperature range identified by the WHO has been acknowledged as the range within which health is optimally protected and is supported by recent scientific findings.[9,10]

There are many studies that explore the relationship between heat and health and it is known that as outdoor temperatures increase so do adverse health outcomes. The majority of these studies use outdoor temperature measures to understand the health risk. Findings from the National Health Service (NHS), UK found daily outdoor temperatures during the summer of 2003 above approximately 25°C to be associated with excess summer deaths.[11]

Older adults are at increased risk of developing heat-related illness due to an impaired ability to regulate body temperature in hot conditions.[12] A study from Germany, examining the relationship between daily maximum outdoor temperature and mortality, found the risk of mortality among nursing home residents to be lowest at maximum temperatures between 16 and 26°C.[13]

Further research into the health impacts of heat from Montreal, Canada identified a significant increase in cases of non-accidental mortality among the general population when outdoor temperatures were above 27°C.[14]

There is a lack of evidence that specifically examines how indoor temperatures influence the health risk from heat. Indoor and outdoor heat are related, although there are some differences. Indoor temperature is modified by other factors related to building design and construction (e.g. quality of insulation), location of apartment unit (level of building, orientation), room type, and occupant behaviour (e.g. activity levels, density of occupants). Yet unlike outdoor temperature, indoor thermal conditions are not routinely monitored which makes studying the association between indoor temperature and health challenging. However, a limited number of studies have focused specifically on the effects of high indoor temperatures, and demonstrate increased health impacts. For example, research from New York City, US found a greater proportion of emergency service distress calls for cases of respiratory illness in people in buildings with indoor temperatures above a 26°C threshold than in buildings with temperatures lower than 26°C.[15]

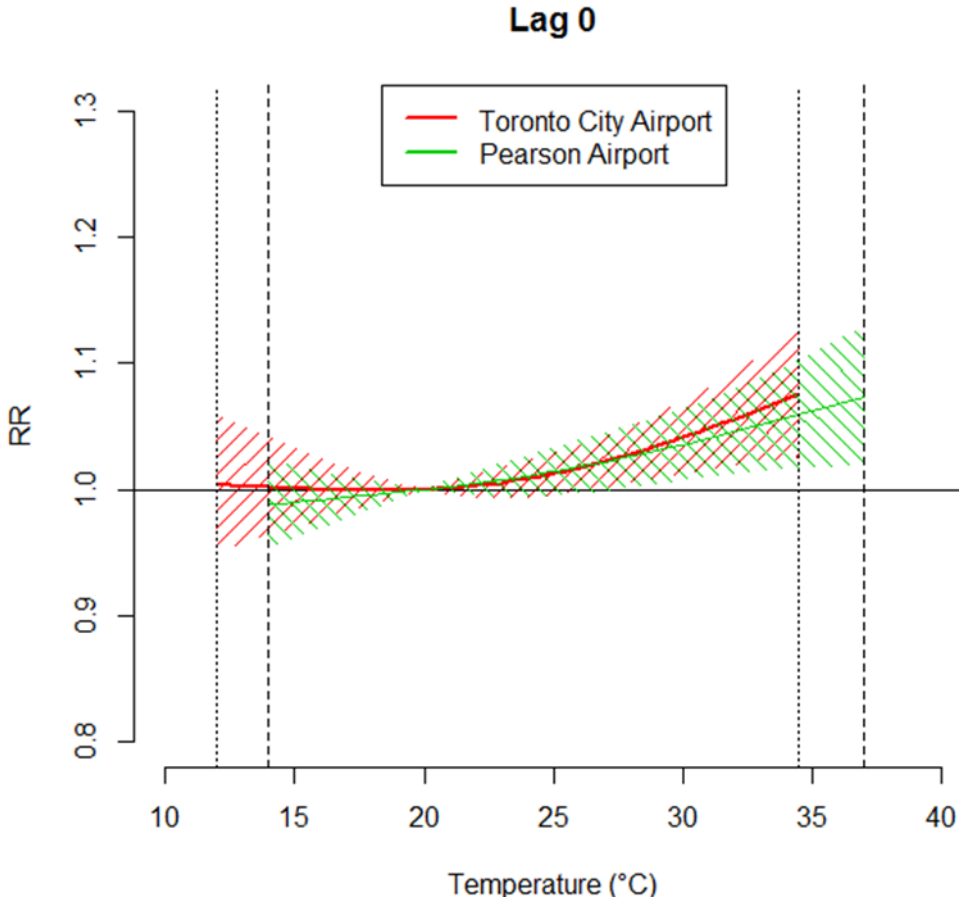
While many of the research studies have relied on outdoor temperature recordings from local weather stations, they are indicative of health risks increasing with temperature, at the population level. Recent studies suggest that indoor temperatures tend to be several degrees warmer than outdoor temperatures in buildings without artificial cooling.[16,17]

**Heat and mortality in Toronto**

Since the June 2015 Board of Health report, "Reducing Health Risk from Extreme Heat in Apartment Buildings", new research has become available from Public Health Ontario (PHO) on the relationship between temperature and all-cause mortality in Toronto. These findings suggest that the risk of mortality, excluding accidental deaths, increases with increasing outdoor temperature over Toronto's summer season (June to August).[18] On average across the entire population of Toronto, there is an increase in the risk of mortality when outdoor temperatures are approximately 26$^{o}$C or higher, compared with the risk at 20$^{o}$C. This relationship is shown as a relative risk curve in Figure 1. In this

figure, 20°C represents a temperature when there is a low risk of experiencing heat related mortality. The likelihood (or relative risk) of experiencing mortality at different temperatures is then compared to the relative risk at 20°C. A relative risk value higher than 1.0 indicates an increased risk of mortality, while a value lower than 1.0 indicates a decreased risk of mortality. As shown in the figure, there is increasing risk of mortality at a temperature of 26°C. The impacts of heat are immediate, with an increased risk of mortality on days with a high maximum temperature.

Figure 1. Relative Risk (RR) of Death in Toronto by Maximum Temperature, June-August 1996-2010




Source: Data analysis conducted by Public Health Ontario (2015).[18]
Notes: The reference temperature for the calculation of relative risks is 20°C.The cross hatching shows the 95% confidence interval for the temperature curve.

These findings have important implications for the health and wellbeing of Toronto's population under both present and future climate scenarios. For example, currently there are approximately 20 days per year when outdoor temperatures exceed 30°C.[19] Findings from PHO indicate that the risk of mortality at 30°C is 4 – 5% higher than the risk at 20°C. Climate models project that by 2049 Toronto will experience 66 days per year when temperatures exceed 30°C, suggesting a substantial increase in heat related mortality over coming decades.

Based on the available health information to date, there is a need to better protect residents from extreme heat, and a health-based maximum indoor temperature standard of 26°C for rental multi-unit residential buildings should be explored.

## Rationale to Explore a Maximum Indoor Temperature Standard of 26°C

The research evidence and Toronto-specific findings of the association between heat and health are supportive of exploring a maximum indoor temperature standard of 26°C. As well, there are other factors that support this threshold. These include consideration of additional health and safety issues related to heat such as unintentional falls in children and quality of sleep.

Multiple agencies are recommending actions be taken to reduce the impact of heat on health at indoor temperatures of 26°C. In the UK, the NHS has recommended that all nursing homes and hospitals provide cooling areas that do not exceed 26°C. In addition, in Ontario, the Long-Term Care Homes Act, section 20(2),[20] requires that, if central air conditioning is not available in the home, the home has at least one separate designated cooling area for every 40 residents. As well, there is a City of Toronto bylaw that sets minimum and maximum temperatures for apartments with air conditioning (Chapter 629, Property Standards). It requires that where air conditioning systems are provided, they should be operated to maintain a maximum temperature of 26°C during the summer. From a health equity perspective, it is important that the same standards are applied to residents who do not have air conditioning in their apartment.

Current standards in the Toronto Municipal Code require that landlords install and maintain window safety devices on apartment windows that are located 2 metres or more above the ground. These safety devices must prevent windows from opening more than 10cm (i.e. the approximate amount of space a child can crawl through). The window safety devices are an important strategy to prevent falls from apartment windows in children. However, in the absence of other options to access cooling, opening windows can be a source of relief from heat for residents. As a result, residents may tamper with the window locks to allow more air to circulate into their apartment,[21] thereby putting children at risk of injury or death from unintentionally falling from the open window.

There has also been a link suggested between warm temperatures and poor quality of sleep.[22] Sleep plays an important role in health and well-being. Insufficient sleep has been associated with many chronic health conditions including diabetes, obesity, cardiovascular disease, and depression.[23,24] In the UK, the Chartered Institution of Building Services Engineers indicates that bedroom temperatures for homes at night should not exceed 26°C, given that thermal comfort and quality of sleep begins to decrease if temperatures rise much above 24°C.[25]

## Stakeholder Engagement

TPH and MLS will engage stakeholders on a range of options to increase access to cooling for residents of multi-unit residential buildings in Toronto. These options include on-site cooling centres, a vulnerable residents list and the feasibility and implications of establishing a health-based maximum indoor temperature standard of 26°C. Two key approaches will be undertaken:

**1. Technical consideration of specific options appropriate to Toronto multi-unit residential buildings:**

TPH and MLS have convened a Technical Advisory Group to provide specific advice on options that might be appropriate for Toronto residents, including interim measures such as on-site cooling centres, and longer-term strategies to support a maximum indoor temperature standard of 26°C, such as building retrofits. The group includes representatives from TPH, MLS, Toronto Building, Tower and Neighbourhood Revitalization, Environment and Energy, Toronto Community Housing, Toronto Hydro and the Toronto Atmospheric Fund.

The Technical Advisory Group will also explore the impacts of such measures on energy efficiency, energy distribution, rent, building capital/operating cost and greenhouse gas emissions, and consider pilot projects for supporting building retrofits and tenant behaviour change.

One component of the technical assessment of specific cooling options is an examination by Legal Services of the legal and regulatory context for these options. Certain pieces of legislation are relevant to this work and may present limitations or opportunities. Relevant legislation includes the Ontario Building Code, the Ontario Residential Tenancies Act and City bylaws pertaining to Heating (Municipal Code Chapter 497), Property Standards (Chapter 629) and Vital Services (Chapter 835). The impact of this and other legislation will be explored as part of the technical consideration of options.

**2. Tenant and building stakeholder engagement:**

In the coming year, TPH and MLS will work with landlords and property managers on guidance to raise awareness of extreme heat for summer, and at the same time engage tenants and building stakeholders through surveys and possibly focus groups on specific future options. These options include the feasibility of implementing a health-based maximum indoor temperature standard of 26°C.

The perspectives from this stakeholder engagement and any proposed approaches will be outlined for consideration in a future report.

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## SIGNATURE

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