To: Mayor and Members
Board of Health

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Re: Heat Health Warning System Update & Review of 2007 Experience
BOH07024(b) (City Wide)

Council Direction:

At the May 29, 2007 Board of Health meeting, the Board of Health approved the recommendation that the Medical Officer of Health report back to the Board of Health annually on the number of heat events and the subsequent costs of the response to the City.

Information:

Background

The development of a Heat Health Warning System (HHWS) is not a mandated program for Ontario Public Health Agencies. Hamilton Public Health Services (PHS) has offered both a Cold and Heat Alert System to its citizens, taking into account the most recent scientific evidence with regards to both Cold and Heat related illness. In particular, since the 2003 European heat wave, many countries have placed a greater emphasis on the development of Heat Health Warning Systems (HHWS). The goal of these systems are to predict weather ‘events’ and thus allow government and community agencies adequate time to activate a planned and co-ordinated response (Newbold & McKeary, 2008).
Table 1

<table>
<thead>
<tr>
<th>Date</th>
<th>Heat Event</th>
<th>Threshold</th>
<th>Humidex high*</th>
<th>Temperature high*</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 26, 2007</td>
<td>Heat Advisory</td>
<td>40+ humidex 1 day</td>
<td>39 humidex</td>
<td>30.4°C</td>
</tr>
<tr>
<td>July 9, 2007</td>
<td>Heat Advisory</td>
<td>40+ humidex 1 day</td>
<td>41 humidex</td>
<td>30.4°C</td>
</tr>
<tr>
<td>July 10, 2007</td>
<td>Heat Warning</td>
<td>40+ humidex 2 - 3 days</td>
<td>39 humidex</td>
<td>31.9°C</td>
</tr>
<tr>
<td>August 1, 2007</td>
<td>Heat Advisory</td>
<td>40+ humidex 1 day</td>
<td>39 humidex</td>
<td>33.3°C</td>
</tr>
<tr>
<td>August 2, 2007</td>
<td>Heat Warning</td>
<td>40+ humidex 2 - 3 days</td>
<td>40 humidex</td>
<td>34.2°C</td>
</tr>
</tbody>
</table>

* Historical meteorological information obtained from Environment Canada

**Heat Health Warning Systems (HHWS)**

A Heat Health Warning System (HHWS) uses meteorological forecasts in conjunction with pre-determined thresholds, to initiate “interventions designed to reduce heat-related impacts on human health during typically hot weather” (Newbold & McKeary, 2008).

A HHWS needs four basic components:

1) A reliable meteorological forecast for the local region in question.
2) A full understanding of the relationship between the thermal environment and Heat Related Illness (HRI), including the evidence-based identification of ‘higher-risk’ meteorological conditions used to activate and deactivate a set of response activities.
3) A set of planned, co-ordinated response activities designed to mitigate the potential health outcomes of intense or prolonged heat, including the evidence-based identification of ‘higher-risk’ populations. To maximize the effectiveness of a response, the response measures should be activated within the lead time provided by the warning.
4) Involvement of the identified critical institutions and community service providers who have sufficient resources, capacity, knowledge and political will to implement a planned response (IBID, 2008).
In 2006, Public Health Services undertook a review of its’ “Heat Alert” protocol, as part of an on-going process to establish Best Practices. Following from this review PHS identified several areas of concern, including: the use of Toronto’s local weather as a proxy for Hamilton forecast data and the lack of a co-ordinated community response to be activated through ‘triggering’ a heat alert. In 2007, Hamilton PHS revised the Heat Alert protocol to utilize local meteorological data to activate a public warning (BOH07024). At the same time PHS also revised the Heat Alert threshold to include a new 3-tier warning system (consisting of a step system of advisory, warning and finally, alert). The three tiered system is sensitive to, and accounts for, the fact that length of time exposed to heat (in addition to temperature and dew point) is a significant risk factor in increasing the probability of Heat Related Illness. PHS, in collaboration with the McMaster Institute of Environment and Health (MIEH), distributed a survey to key Community Agencies working with identified ‘vulnerable’ populations. The survey was designed to assess how well PHS health messaging was being received by service providers. Significant findings from survey are outlined in Appendix A.

In 2007, Hamilton Public Health Services issued 3 Heat Advisories and 2 Heat Warnings covering a total of 5 days. No Heat Alerts were issued, as no single heat event was longer than 3 days in duration, or exceeded a humidex value of 45. There were no costs associated with the City response, as the current City Response Plan is activated at the Heat Alert stage of the trigger, not the Heat Advisory or the Heat Warning stages. Table 1 outlines heat event days in relation to the threshold, and the actual daily high temperatures and humidex values.

Heat & Human Health

The human body contains a multitude of intrinsic ‘cooling’ mechanisms which serve to regulate core temperature within the range of 37°C to 39°C. However, when there is an increase in ambient temperature or when humid conditions limit the evaporation of sweat (an important cooling mechanism) these mechanisms may become overwhelmed and unable to operate efficiently. In addition certain medical conditions may be exacerbated by temperature and humidity. There is also a health risk for those individuals prescribed certain medications which inhibit effective functioning of the thermoregulatory system which ultimately, increase their vulnerability to Heat Related Illness (HRI).

H.R.I. is an umbrella term for various conditions, ranging from skin irritation commonly referred to as heat rash, to an acute life threatening condition, referred to as Heat Stroke. Skin irritations and cramps may signal a warning that precautions are necessary in order to prevent the onset of Heat Exhaustion. Heat Exhaustion may also occur independently of other heat related illnesses. Heat Exhaustion may develop over several days of exposure to high temperatures, or combinations of temperature and humidity. Symptoms may include heavy sweating, pale skin, weakness, dizziness, nausea, vomiting, headache, and fainting. If the early signs of Heat Exhaustion are not attended to the condition can rapidly progress to the more life threatening Heat Stroke (IBID, 2008).

It can be difficult to establish the impact of HRI’s on mortality and morbidity statistics since, as mentioned previously, temperature and humidity can exacerbate other pre-
existing health conditions making it difficult to establish a causal relationship. Also there is often a time lag between a 'heat event' and the occurrence of a population level mortality increase. As a result, the impact of a heat event at the population level may be vastly underestimated and morbidity and mortality estimates may be inadequate for measuring the actual public health risk (IBID, 2008). Another factor that can confound mortality and morbidity statistics is poor air quality. Smog is frequency formed with high temperatures, and some health outcomes observed with hot weather may have resulted more directly from the smog.

Using Humidex Data as the basis for the ‘Trigger’

Most HHWS establish one of three criteria as the catalyst for activation of a response plan; heat (actual temperature), humidex (an apparent temperature index which combines actual temperature with humidity), or an air mass model (such as the proprietary model utilized by Toronto Public Health). There is a gap in the literature evaluating the relative predictive value of these catalysts/triggers (Newbold & McKeary, 2008). Currently Hamilton PHS is using a humidex forecast developed by Environment Canada (EC) combined with the previously mentioned three tiered advisory system (advisory, warning and alert).

PHS believes the humidex forecast system is a reliable tool for issuing a public caution with regards to potential heat health risks. In 2007, the actual maximum daily temperature during a heat event was between 30°C and 34°C, and actual maximum daily humidex value was between 39 and 41 (please refer to earlier table).

Best Protection Practices

Evidence has shown that access to air conditioned places, even for a few hours on a daily basis is the **most effective** protection against heat related morbidity and mortality. Despite this fact, the establishment of centralized cooling centres has not been demonstrated to be effective in reaching those most at risk. ‘At risk’ groups may include those who are socially isolated, seniors, young children, those who suffer from psychiatric illness and others who are vulnerable for a number of reasons (Newbold & McKeary, 2008). As such, it is important for Hamilton PHS to partner with community agencies willing to relay appropriate health messaging to their vulnerable clients, and staff, as well as the general public (Newbold & McKeary, 2008 b).

References


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Summary of Significant Survey Findings

• 70% of service providers were aware of the new system for PHS’s Heat Health Warning System.

• 91% of service providers were satisfied with the current trigger of 40 humidex.

• 61% of service providers believed a gradient system was good.

• 100% of service providers requested that PHS take the lead role for heat health messaging, including signs and symptoms of HRI, precautionary messaging, and health interventions.

• 80% of service providers were willing to take responsibility for distribution of a heat health brochure and for displaying and removing a heat alert poster.

• 74% of service providers wish to be notified directly by PHS in the event of a Heat Alert.