# SYNDROMIC SURVEILLANCE SYSTEM FOR HEAT-RELATED ILLNESSES

| SECTOR | DEPARTMENT | ADAPTATION TYPE | DRIVER | FUNDING SOURCE |
|---|---|---|---|---|
| ○ Food<br>● Health<br>○ Infrastructure<br>○ Natural Systems<br>○ Planning<br>○ Water Conservation | ○ Communications<br>● Environment<br>○ Finance/Purchasing<br>○ Infrastructure<br>○ Parks & Rec<br>○ Planning<br>● Public Health<br>○ Water/Stormwater | ● Decision Support Tools<br>○ Delivery of Adaptation Options<br>○ Plans + Policies<br>○ Programs + Initiatives | ● Anticipatory<br>○ Reactive | ● Federal<br>● Municipal<br>● Other<br>○ Private<br>○ Provincial |

**PROFILE** *Extreme heat events are expected to be more common and intense in Ontario communities. Across the province, health units are working with partners and stakeholders to better prepare their communities to adapt to these events, and to prevent and reduce heat related illnesses and deaths. Heat Alert and Response Systems along with educational campaigns, have been adopted by several communities to detect and respond to extreme heat events and to raise awareness about adverse health outcomes of heat, especially among the most vulnerable populations. While public health interventions may include direct actions such as the use of cooling centres and water distribution programs, recent efforts have focused on health care system capacity during a heat-related event.*

*Syndromic surveillance analyses medical data to detect disease outbreaks. In Southeastern Ontario, four health units are participating in a pilot project where an existing syndromic surveillance system has been adapted to monitor real-time environmental heat and heat-related illnesses. The system is being used to detect heat-related morbidity in 11 hospitals within the combined region. The results of this pilot project will support public health professionals by providing them with more detailed evidence-based information regarding which populations are vulnerable to heat-related illnesses, and by helping them to provide efficient and effective care during extreme heat events.*

**GEOGRAPHIC CONTEXT** The four health units participating in this pilot project are located in Southeastern Ontario and include:

- Hastings & Prince Edward Counties,
- Leeds, Grenville & Lanark District,
- Peterborough County-City, and
- Kingston Frontenac and Lennox & Addington (KFL&A)

These agencies cover an area of close to 24,000km$^2$ and serve a population of approximately 655,000.

The four units vary in geographical makeup and population sizes with Leeds and Hastings Units serving largely rural areas, while Peterborough and KFL&A Units serve a mixture of urban and rural areas.

**CLIMATE CHANGE CONTEXT** Like many Ontario communities, Hastings County, Leeds & Grenville, Peterborough and KFL&A are becoming increasingly concerned about extreme heat. This is an especially pressing concern given that under a rapid growth emissions scenario that reflects current trends (A1B)[1], these communities will experience a 2.8 °C increase in average annual temperature by the 2050's. Increases in the duration of extreme heat events using the Heat Wave Duration Index (HDI) have also been projected. This index is defined as the maximum period of consecutive days that are 5°C above the climate normal. These findings provide strong motivation for managing health capacity in the face of a heat event.

[1] The A1B scenario assume rapid population growth and reliance on a variety of energy sources thus producing a medium level of greenhouse gas emissions.

**ISSUE** More frequent and intense heat events will become a risk that Ontario communities must address. In many cases, these events can result in an increased risk to health, or death. The institutional capacity to handle these events has evolved as a key concern. If temperatures are sustained above 30°C for long periods of time, heat related illnesses will become more likely and health care providers want to be assured that they can accommodate the increase in patient load. To increase capacity in Ontario, Health Canada has partnered with KFL&A and three other health units, to monitor heat-related morbidity in Eastern Ontario.

*Syndromic Surveillance System as a Base*

The pilot project relies on a syndromic surveillance system developed in 2004 by KFL&A health unit, in conjunction with the Ministry of Health and Long-term Care. Designed to track infectious disease outbreaks, the real-time system monitors information provided by patients during their initial triage evaluation by health staff.[2] Analyzing this data, including the chief complaint and primary symptoms, along with de-identified information about the patient and circumstances of their arrival,[3] the surveillance system can identify symptomatic trends.[4] When mapped, this data can help health units pinpoint vulnerable populations and locations and to track the effectiveness of heat-related intervention strategies in real-time. Given the program's reliance on syndromic surveillance, the pilot project was limited to four health units where the system had already been established.[5]

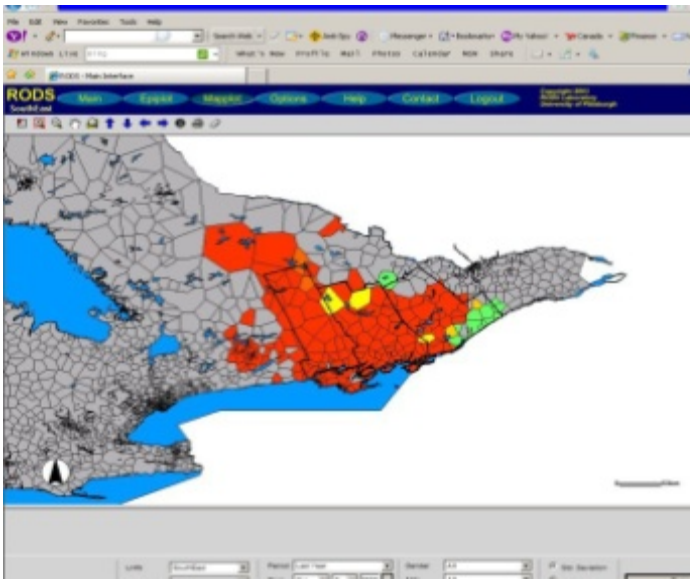
*Refining the Surveillance System to Address Heat*

To specifically consider heat-related morbidity, an algorithm has been developed to narrow the focus of the syndromic surveillance system, considering only symptoms commonly associated with heat-related illnesses. Some examples include:

- Sunburn
- Sun stroke
- Heat stroke
- Exhaustion

Additionally, heat monitors based on Wet-Bulb Globe Temperature (WBGT) sensors were installed strategically over each region to capture real-time heat data that includes measurements of air temperature, humidity, wind speed and solar load. Combining the readings from each sensor produces a WBGT index which can be used to assess heat stress.

Project staff integrated heat data collected from each region into the syndromic surveillance system to get a better understanding of the spatial distribution of heat-related illnesses, but also of the relationship between heat and adverse health indicators such as an increase in the number of emergency department visits. This information can be used to determine the locations that are most likely to need assistance in managing and responding to a heat event. Theoretically, through mapping, public health units can deploy intervention strategies including water bottle distribution, door to door checks and cooling centres based on geographic need. The syndromic surveillance for heat project is currently in the process of being validated through an extensive testing period. During this process, the system is used for event monitoring and the identification of trends during heat events. However the data gathered has not been used to inform health response yet. To validate the data, the results are analyzed using data from the 11 participating hospitals after a heat event to ensure that the system accurately identified trends and high-risk areas. Partners hope that the validation process will be completed by 2013. At that point, the data from the WBGT sensors, in conjunction with the data from the refined syndromic surveillance units, will be used by the participating health units to inform their heat response plans during heat events.




*EDSS System*
*- Courtesy KFLA Public Health*

[2] Including emergency departments and urgent care facility staff

[3] These include gender, time, etc.

[4] Complete automation of the syndromic surveillance system is possible with automated anomaly and spatial detection

[5] As listed above, these include: Kingston Frontenac Lennox & Addington; Hastings & Prince Edward Counties; Leeds, Grenville and Lanark District; Peterborough County-City

*Next Steps* With syndromic surveillance and wet bulb globe technology in place, the four health units would be able to delve further into heat morbidity patterns. KFL&A has begun to develop several new layers for the map which could help participating health units to pinpoint their vulnerable populations with greater accuracy and focus current heat alert and response strategies. These include a socioeconomic layer and age-based mapping focusing on the very young and old.

Since 2009, many other communities have introduced syndromic surveillance in their public health strategies. Currently, approximately 75 hospitals have been integrated into the system based at KFL&A. To expand the network of heat morbidity mapping, it would be beneficial for each community to integrate wet bulb globe technology into the network. However, municipalities may still be able to conduct mapping by combining the detection of heat-related illnesses (through the syndromic surveillance system) with heat alert systems from Environment Canada.

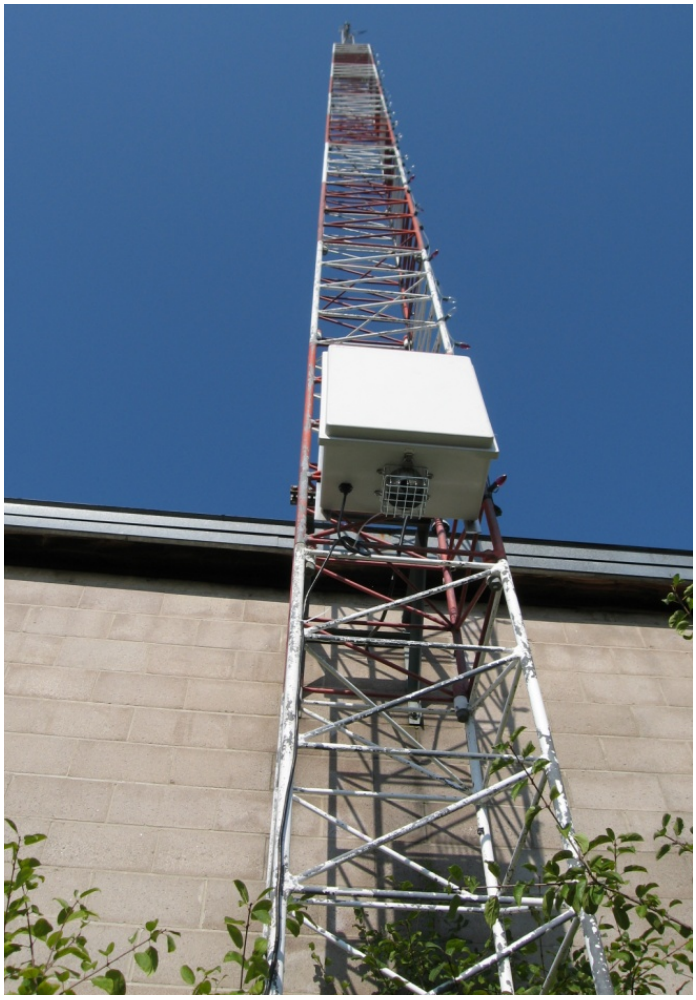
**PARTNERS** The system relied on a partnership between Health Canada and KFL&A Health Unit.

Health Canada approached KFL&A to adapt the existing system to specifically consider heat-related morbidity. To facilitate this transition, Health Canada contributed funding to acquire and integrate real-time heat data into the syndromic surveillance system. Their support for the program will also help facilitate expansion efforts in the future.

As the developer of the syndromic surveillance system, KFL&A was the primary partner in the heat morbidity mapping program. Engaging three other health units that had established syndromic surveillance systems in their regions, KFL&A played a leadership role in acquiring data needed for the program.

**CHALLENGES** A number of challenges were encountered in the development and validation of the syndromic surveillance system for heat program. Some examples include:

*Financing* Long-term financing remains a significant challenge for the program. Though Health Canada has committed to supporting the expansion of the program, there will be little external financial support available for the maintenance of the program (including data analysis, staff time and maintenance of equipment) in each health unit. Some of the larger units may be able to undertake this additional cost, but smaller units may not be able to.



*Wet Bulb Globe Temperature Sensor - Courtesy Geof Hall*

*Community Capacity* While the monitoring program can help a health unit to identify vulnerable areas and populations within their boundaries, the region must have the institutional capacity to address the identified issues. In smaller communities, the use of heat morbidity mapping may not reduce risk if the health units or municipal emergency response departments do not have the capacity to respond to alerts and employ primary prevention strategies.

*Symptom Limitations* To identify heat related morbidity, the program tracks the most common symptoms of heat-related illnesses. Though this system can correctly identify heat related illness in most cases, at present it does not account for other co-morbidities which are not statistically validated. For instance, certain illnesses that are exacerbated by heat (e.g. heart attacks) are not currently tracked as their statistical significance within the larger picture of a heat-related event is not clear using current emergency department triage methods. This exclusion currently underestimates heat-related illness when the system is used

**LESSONS LEARNED** *Over the development of the heat morbidity mapping program, many important lessons have been learned. These include:*

- **Public engagement is a necessary aspect of any heat vulnerability identification and reduction efforts.** To ensure maximum public participation, heat vulnerability information should be available to the public using visual tools such as maps. Communicating risk to the public in this way could help them protect themselves from heat health risks and determine where to go to get assistance if needed.

- **The future of this program relies on dedicated organizations to ensure the constant flow of data.** Because there are currently no long-term funding sources available to maintain and expand this program, its future will be dependent on the dedication and commitment of public health units to continue uptake of the technology, and continued support from Health Canada.

- **An investment in technology will help to increase adaptive capacity for the future.** By integrating real-time heat data into existing syndromic surveillance networks, KFL&A and three other health units will enhance their ability to respond to extreme heat events and better protect their communities.

## FURTHER INFORMATION

Map of Health Units

Queen's Public Health Informatics

Natural Resources Canada Ressources naturelles Canada
Canada

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