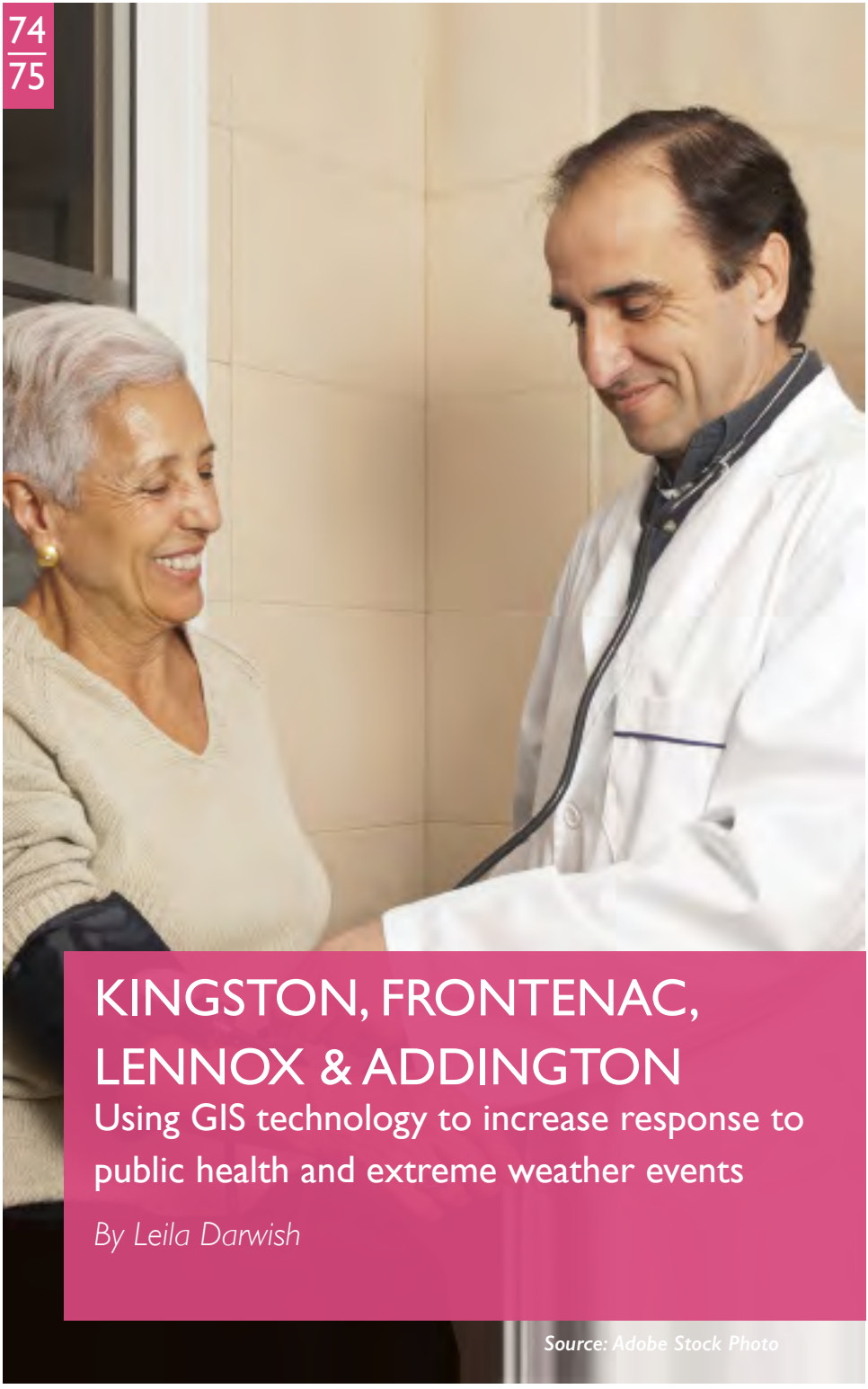

KINGSTON, FRONTENAC, LENNOX & ADDINGTON

Using GIS technology to increase response to public health and extreme weather events

By Leila Darwish

Source: Adobe Stock Photo

THE SCIENCE

Extreme weather events can produce a number of public health issues, especially for vulnerable populations. Extreme heat events can lead to an increase of emergency room visits or hospital admissions due to heat related illnesses, with particular strain on the elderly and those with chronic health concerns. Wildfires, extreme cold, floods, and tornadoes can cause a variety of public health issues that impact communities and require timely response from the health care system. Kingston, Frontenac and Lennox & Addington (KFL&A) Public Health has developed two unique tools that create real-time situational awareness to help decision makers prepare for and quickly respond to a variety of public health and environmental emergencies. These tools are the Acute Care Enhanced Surveillance (ACES) and the Public Health Information Management System (PHIMS).

THE TRIGGER

Following the SARS outbreak, it became clear that investments were needed to improve the capacity of Ontario's public health system to prevent and respond to outbreaks of infectious disease. In 2004, KFL&A Public Health was given funding for a pilot program to start real time surveillance of their acute care partners, in order to detect disease outbreaks, a rise in overdoses indicating potential new illicit drugs in the area, the effects of heat waves, and more. This pilot program led to the creation of the Acute Care Enhanced Surveillance (ACES), which is now used province-wide. The Public Health Information Management System (PHIMS) was developed later, to support the Pan-American Games in 2015. The tool has since expanded its focus to include environmental health threats, adding meteorological data along with population data including marginalization layers. This allows PHIMS to be used to monitor and to provide increased situational awareness during air quality events, extreme heat, and extreme cold events, storms, forest fires, and more.

THE APPROACH

ACES is a real-time syndromic surveillance system with temporal and spatial capabilities that enables decision makers to be better informed about the health of the community, and enhances collaboration and communication between public health and the acute care sector. It allows hospitals in Ontario to monitor emergency departments' volume, admissions, and surge capacity. ACES monitors changes and trends in the incidence of endemic disease and can detect new or emerging public health threats, like influenza. It can also be narrowed down to monitor the health impacts of a particular hazard or event. It is useful in detecting the impact of extreme heat events, as well as air quality issues resulting from forest fires, on a population's health. Since the data is collected in real time and is based on disease symptoms rather than diagnosis, there is an increased ability to detect and respond to public health events early.

PHIMS uses GIS technology for the identification, visualization and spatial analysis of environmental data with underlying population-based factors, enhancing public health situational awareness to better predict, prepare, and respond to extreme weather

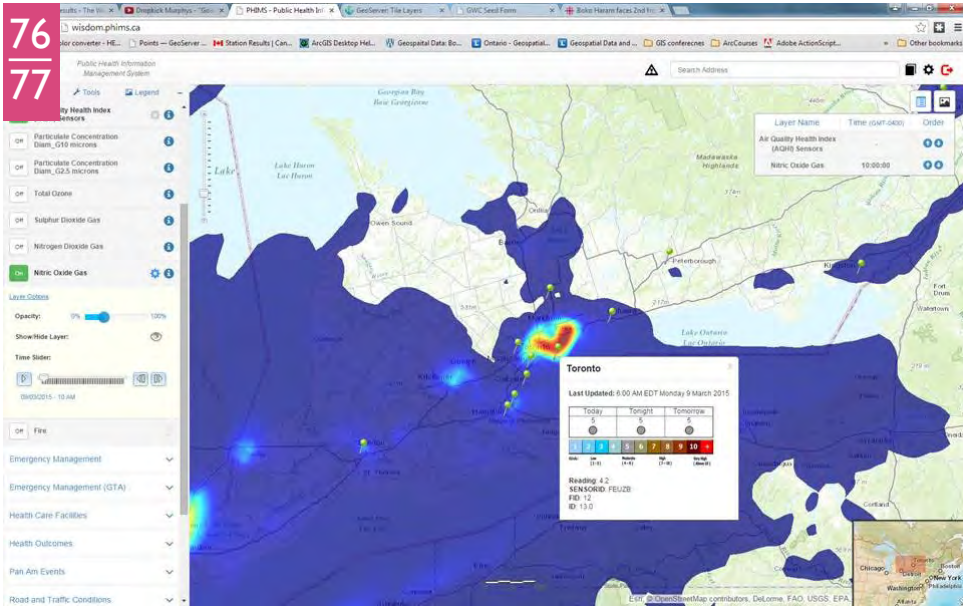

Figure 18: *PHIMS uses GIS technology for the identification, visualization and spatial analysis of environmental data with underlying population-based factors, enhancing public health situational awareness to better predict, prepare, and respond to extreme weather events and other environmental emergencies (Source: KFL&A Public Health)*

events and other environmental emergencies. Using PHIMS, decision makers have access to real-time weather feeds, socioeconomic data, demographic information and timely health outcome figures. If a hazard is affecting a certain part of the province, the tool can quantify how many residents may be living in the at-risk area. It can also describe the complexities of the impacted population by displaying important socioeconomic information that contributes to the degree of vulnerability. This information can help emergency management personnel to prioritize evacuations from certain areas of the community that have been identified as having increased vulnerability.

PHIMS and ACES can be used together to assist decision makers in preparing and responding to extreme weather events. PHIMS can provide predictive 3-day modelling of environmental factors as well as critical information on the characteristics of the impacted population, and ACES can monitor the health of the population for unintended health consequences. If health impacts beginto emerge, the system will send out an alert, and those effects can be communicated to the relevant health and emergency management partners so that they can engage in timely interventions to support the impacted populations.

THE OUTCOME

Today, ACES has expanded province-wide, linking up 160 hospitals and helping improve public health protection and prevention initiatives for everything from influenza to extreme heat events. Over 150 Public Health users across the province

have been trained by KFL&A Public Health to interpret the data. ACES is used annually for the yearly influenza outbreak, which allows Public Health to monitor the impact on the population and health care system. It was also used in 2010 to assist first responders and emergency operations personnel in determining the extent of the injuries caused by an F2 Tornado that struck Midland, Ontario. ACES and PHIMS were used in 2013 to support the response to a large urban fire near downtown Kingston. Most recently, ACES and PHIMS have been used to provide important information to decision makers for the extreme heat events and forest fires in Ontario in 2018.

When it comes to forest fires, PHIMS has a modelling tool that allows it to predict the movement of the particulate plume (PM2.5 smoke forecasting) and visualize how smoke will spread across an area. ACES can monitor vulnerable populations and their health impacts from the plume of that fire in real-time. In the case of extreme heat events, PHIMS has already mapped out the heat islands and highest risk areas for heat in different municipalities in Ontario. This can help decision makers to understand where the biggest risks and impacts will be for an extended heat event, as well as overlay key characteristics of the population that may be impacted. This information can also be used to inform future planning of a city in terms of mitigation.

A WORD FROM KINGSTON, FRONTENAC AND LENNOX & ADDINGTON

"It is a given that communities will experience more extreme weather events as a result of climate change, and decision makers need real-time information and situational awareness to prepare and respond. No matter what the incident is, we track it and monitor it on behalf of the province," states Dr. Kieran Moore, the Medical Officer of Health and CEO of KFL&A Public Health. "ACES and PHIMS are tools for this, and they are well worth their investment. We would like to see these tools more widely adopted to provide better response and protection for our communities."

Dr. Paul Belanger, the Director of Knowledge Management at KFL&A, stressed the efficiency of ACES and PHIMS in analyzingand sharing important data with public health and emergency management decision makers. "We bring all the data together from disparate systems into a single unified system and it makes everyone's job easier."

When it comes to hazard mitigation and emergency management, Dr. Moore emphasized a key feature of PHIMS. "PHIMS spatially incorporates information from response and recovery cycles into the geographic tool. For an extreme heat event, this can include the location of cooling centers and hydration stations. It can also include the location of high risk facilities with vulnerable populations, such as an assisted living facility. You can start preparing for an event long before it happens, and once you identify risk, you can start mitigating it."