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Real-Time Surveillance of Environmental and Demographic Data in Ontario with PHIMS

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Objective

To describe how the Public Health Information Management System (PHIMS) tool is used by KFL&A Public Health to enhance real-time situational awareness and assist with evidence informed decision-making to help protect the health of the population.

Introduction

Geographic Information System (GIS) applications are increasingly being used for public health purposes. GIS technology provides visual tools – through the creation of computerized maps, graphs, and tables of geographic data – that can assist with problem solving and inform decision-making. PHIMS aims to enable visualization and spatial analysis of environmental data with underlying population based indicators. PHIMS displays many layers of environmental information across Ontario, and users can view maps demonstrating environmental or demographic data as they apply to specific geographic areas. This is useful for observing where environmental events are occurring, detecting potential emergency situations, and identifying areas with vulnerable populations. By displaying available, real-time, environmental data from multiple partners through PHIMS, public health events can be identified earlier to better prevent, prepare for, and respond to emergencies.

Methods

PHIMS collects and compiles environmental and demographic data, and uses web-based mapping applications, spatial analytic functionality, and third party libraries to achieve map visualization of the information collected. The data collected by PHIMS is derived from various sources. Some of these sources include: Statistics Canada, Environment Canada, Ministry of the Environment, U.S Geological Survey, Ministry of Natural Resources, Canadian Nuclear Safety Commission, the Ontario Marginalization Index, and Standard Public Health Service data (e.g. Tap into Kingston, Cool Down and Warm Up Centres, Immunization Sites, etc.).

PHIMS encompasses several tools and functions that can be accessed through a web-based user interface. PHIMS users can choose from several basemaps to visualize their map with different geographic features. Users have the ability to apply demographic layers related to age, deprivation, and marginalization to the selected basemap, which allows for colour-coded visualization of the social determinants of health as they apply to different geographic locations. These options enable users to easily view where the most vulnerable populations reside, which will help prepare and prioritize resources in the event of a public health emergency. PHIMS also enables map visualization of real-time environmental conditions, because environmental layers related to weather radar data, weather conditions, stream gauges, and heat information can also be added to the basemap. PHIMS includes several layers which visualize other pertinent public health data, such as: forest fires, wildfire smoke forecasts, well water uranium levels, nuclear reactor locations, earthquake information, and various factors relating to the Air Quality Index, wind strength and direction, as well as plume dispersion of pollutants and toxins.

Conclusions

Having a GIS tool, such as PHIMS, to visualize environmental and population based data in real-time on virtual maps, facilitates identification of emergencies earlier than through traditional public health methods. PHIMS, therefore, enhances public health situational awareness to better predict and prepare for extreme weather events and other environmental emergencies. Additionally, PHIMS can provide insight into where vulnerable populations are located, so that resources can be properly allocated in the case of an emergency.

Keywords

GIS; map; enviornmental; geographic; demographic