

# GIS Mapping of Occupational Health Visit Data from a Southeastern Ontario Tertiary Care Hospital

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## OBJECTIVE

This paper describes a GIS tool which maps the floors and departments of a Southeastern Ontario tertiary care hospital for the purpose of monitoring respiratory and gastrointestinal (GI)-related Occupational Health (OH) visits among hospital employees.

## BACKGROUND

Health care workers (HCWs) have an increased risk of exposure to infectious agents including (among others) tuberculosis, influenza, norovirus, and *Clostridium difficile* as a consequence of patient care<sup>1,2</sup>. Most occupational transmission is associated with violation of one or more basic principles of infection control: handwashing; vaccination of HCWs; and prompt isolation.<sup>3</sup> OH surveillance is paramount in guiding efforts to improve worker safety and health and to monitor trends and progress over time.<sup>4</sup> GIS can assist in supporting health situation analysis and surveillance for the prevention and control of health problems, for example: by creating temporal-spatial maps of outbreaks, public health workers can visualize the spread of cases as the outbreak progresses; spatial/database queries allow for selection of a specific location or condition to focus public health resources.

## METHODS

QPHI (Queen's Public Health Informatics) in collaboration with Kingston, Frontenac, Lennox & Addington (KFL&A) Public Health and Sault Saint Marie Innovation Centre (SSMIC) developed a GIS tool capable of mapping the floors and departments of a Southeastern Ontario tertiary care hospital in order to monitor GI and respiratory-related OH visits among hospital staff. The tool makes use of Environmental Systems Research Institute's (ESRI) ArcGIS suite of mapping software. Using ArcMap, two dimensional (2D) floor plans of the hospital can be visualized; the use of ArcScene enables the creation of a three dimensional (3D) model of the hospital. OH visits for GI and respiratory illness were aggregated into weekly rates, and this data was linked to spatially referenced departments within the hospital representing how many staff were reporting GI or respiratory illness in a given week.

## RESULTS

A norovirus outbreak occurred in March 2007 at the hospital. The GIS tool was able to identify departments in the hospital experiencing higher rates of GI illness reporting. The maps indicated the ward associated with the outbreak had a higher percentage of staff reporting GI illness to the OH department.

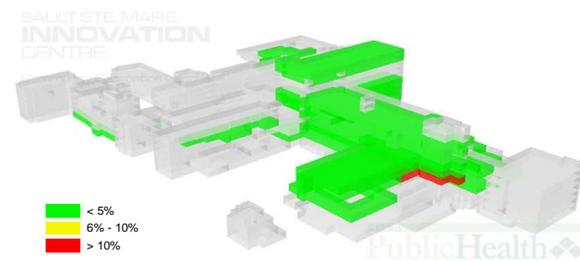


Figure 1 – Percent of OH visits due to gastrointestinal illness for the week of March 11–17, 2008. Note: Same timeframe as a known patient norovirus outbreak was occurring at the hospital

## CONCLUSIONS

The maps generated by the tool (both 2D and 3D) provide a visual picture of GI and respiratory-related illness reporting to OH among staff working in different areas within the hospital. This can assist in determining how potentially infectious diseases may be spreading between departments and provides enhanced early warning for communicable disease outbreaks among staff. Next steps include real-time mapping capability, and monitoring of both staff and patients infectious diseases which may help to characterize the occurrence and transmission within the hospital and allow for rapid implementation of appropriate infection control procedures to minimize the risk to HCWs and patients.

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## REFERENCES

- [1] Sepkowitz K. Occupationally acquired infections in health care workers: part I. *Ann Intern Med* 1996;125(10):826-834.
- [2] Buxton Bridges C, Kuehnert MJ, Hall CB. Transmission of Influenza: Implications for Control in Health Care Settings. *Clin Infect Dis* 2003;37:1094-1101.
- [3] Koh D, Aw T-C. Surveillance in Occupational Health. *Occup Environ Med*. 2003;60:705-10.
- [4] Centres for Disease Control. National Institute for Occupational Safety and Health. NIOSH Safety and Health Topic: Surveillance. <http://www.cdc.gov/niosh/topics/surveillance/> (Accessed June 3, 2008). Further Information: Tara Donovan [tdonovan@kflapublichealth.ca](mailto:tdonovan@kflapublichealth.ca)