

# Syndromic Surveillance and Zip Code Data: The Role of Zip Codes in Understanding Populations

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## **OBJECTIVE**

To examine the distribution of residential zip codes among patients in Boston emergency departments (EDs) over a two month period to better understand how this type of spatial analysis may affect the sensitivity of syndromic surveillance.

## **BACKGROUND**

Syndromic surveillance systems use residential zip codes for spatial analysis to identify disease clusters. However, the use of emergency medical services can be influenced by geographic proximity, specialty services, and severity of illness. We evaluated zip codes reported to the Boston Public Health Commission's (BPHC) syndromic surveillance system from 10 Boston EDs.

## **METHODS**

Between January 28 and March 7, 2005, there were 47,973 visits to Boston EDs reported to the BPHC syndromic surveillance system. Of these, 513 had unknown or unidentifiable zip codes. We grouped the remaining 47,460 residential zip codes into the following exclusive regions: 1) Boston, 2) Massachusetts, not Boston (MA), 3) New England (NE; includes Vermont, Maine, New Hampshire, New York, Connecticut, and Rhode Island) or 4) US (zip codes from 30 other US states). Boston zip codes were further categorized into the city neighborhoods.

## **RESULTS**

Of the 47,460 visits, there were 245 visits with retired zip codes (no longer official zip codes as defined by the US Postal Service). Boston residents accounted for 55.4% of the 47,460 visits with an additional 25.6% of visits by persons from the greater Boston area. Other non-Boston zip codes included 7,189 (15%) MA, 928 (2%) NE, and 490 (1%) US. NE zip codes were significantly more common than those from western Massachusetts. The proportion of Boston residents (n=26,560) who sought care at any particular site ranged from 6% to 25%. Of the 490 encounters in the US group, visits by hospital varied from 1% to 28%. The ED usage rate for Boston residents was 36.8 per 1,000 but varied by

neighborhood from 21.0 to 64.0 per 1,000. The ED visit rate for Boston residents inversely correlated with neighborhood socio-economic markers.

## **CONCLUSIONS**

All Boston hospitals demonstrated wide variability in the geographic distribution of persons seeking emergency care at the site. Location and hospital services (specialty care) are likely contributing factors. The non-Massachusetts resident group appears to include visitors, persons requiring specialty care such as transplant patients, and college students. (Hospital registration systems capture billing addresses, and students are more likely to report their parents' address.) Further evaluation of zip code classification may improve the aberration detection ability of our syndromic surveillance system to monitor the health of visitors (especially during high profile events) and the college population.