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Google Flu Trends: Spatial Correlation with Influenza Emergency Department Visits

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Objective

To test if Google Flu Trends (GFT) is predictive of the volume of influenza and pneumonia emergency department (ED) visits across multiple United States cities.

Introduction

GFT is a surveillance tool that gathers data on local internet searches to estimate the emergence of influenza-like illness in a given geographic location in real time.[3] Previously, GFT has been proven to strongly correlate with influenza incidence at the national and regional level.[2,3] GFT has shown promise as an easily accessed tool to enhance influenza surveillance and forecasting; however, further geographic validation of city-level data is needed. [1,2,6]

Methods

Using Healthcare Cost and Utilization Project (HCUP) data, we collected weekly counts of ED visits for all patients with ICD-9 codes for pneumonia or influenza from 2005-2011 at 19 different cities geographically spread throughout the US.[5] Corresponding GFT data for cities and associated states were collected.[4] We then evaluated the correlation between GFT and the volume of pneumonia and influenza-related ED visits in each city.

Results

Correlation coefficients between city-level GFT and ED visits for pneumonia and influenza from 19 different cities range from 0.67 to 0.93 with a median of 0.84. Coefficients are shown geographically in Figure 1.

Conclusions

We demonstrate a strong correlation between city-level GFT and ED visits for pneumonia and influenza across numerous US cities. Establishing broad geographic generalizability of city-level GFT is key to understanding its capabilities and further integration into other surveillance or forecasting models.

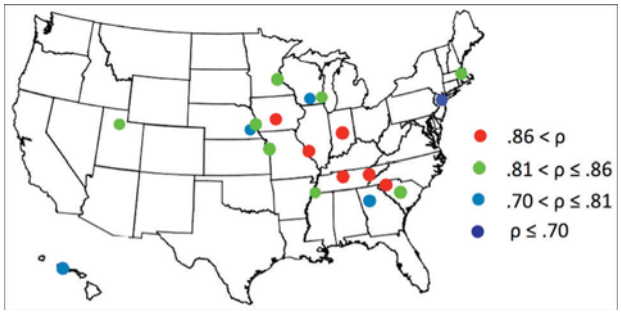

Figure 1: Geographic representation of 19 cities and their respective correlation coefficients for city-level GFT and influenza and pneumonia-related ED visits.

Keywords

Google Flu Trends; data science; big data; influenza; surveillance

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