GeoMedStat: An Integrated Spatial Surveillance System
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Purpose
Purpose of this project was to develop a real-time surveillance system which can assist in timely intervention and providing efficient healthcare.

Introduction
Real-time surveillance of hospital admission information can help in better healthcare preparation, identifying potential outbreaks, and public health awareness when necessary. When such patient surveillance systems are integrated with tracking environmental pollutants associated with certain types of admission that may even help more effective interventions.

At UMMC, we have developed GeoMedStat, an integrated spatial surveillance system capable of tracking and mapping both real-time and historical patient encounters along with air pollution data. GeoMedStat has links to hospital information systems allowing real-time access to both Chief Complaint and ICD of patient encounters. The currently tracked healthcare events are daily: a) real-time asthma hospitalization from the UMMC hospital system and b) historical statewide asthma hospitalization from the MSDH.

Environmental air quality has a major impact on human health. PM2.5 and ozone (O3) are known to exacerbate asthma and other health problems. GeoMedStat utilizes NASA satellite data and EPA ground-monitored data as inputs for surface modeling of PM2.5 and O3.

Implementation of real-time or near real-time integrated surveillance system is a challenge due to: a) disparate sources of data; b) different types of data; c) data incompatibility and d) lack of standardized technological components. In addition, accessing and utilizing health data that are considered as PHI, requiring stringent protocols, have to be supported by the system. This presentation aims to illustrate the development of GeoMedStat, its components and functionality.

Methods

University of Mississippi Health Care (UMHC) System Data Interface Architecture with GeoMedStat

Data of Interest: ICD
to illustrate the development of GeoMedStat, its components and functionality.

Data Resolving into One Common Scale

Automated Geocoding Process: from street address to aggregated data
1. Trigger: scheduled service triggers the process at a fixed time
2. Identify required data: query patient records from the hospital database based on ICD and Chief Complaints
3. Extract records: extract selected patient records
4. Geocode: conduct geocoding. First street-level and then at ZIP code level for the remaining unmatched records
5. Identify required data: query patient records from the Mississippi State Department of Health (MSDH) database (10 km x 10 km block group level and county FIPS). The GeoMedStat database stores the grid ID and county code instead of any address or point location
6. Identify required data: query patient records from the hospital database based on ICD and Chief Complaints
7. Run regression model to estimate Ground Level Particulates (GLP) for PM2.5
8. Run a regression model to estimate Ozone (O3) concentrations

User Interface: Number of admissions per 10K population, PM2.5 and O3 within the 10 km x 10 km grids for a given day or for a range can be displayed on maps

Key:
- Data Resolving into One Common Scale
- User Interface:
  - Number of admissions per 10K population
  - PM2.5 and O3 within the 10 km x 10 km grids for a given day or for a range can be displayed on maps

Results

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