Geospatial Modeling of Asthma Population in Relation to Air Pollution
A Decision Support for Health Administration

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Abstract
Current observations indicate that asthma is growing every year in the United States, specific reasons for this are not well understood. This study forms an ongoing research effort to investigate the spatio-temporal behavior of asthma and its relation to air pollution. The association between environmental variables such as air quality and asthma related health issues over Mississippi state are investigated using Geographic Information Systems (GIS) tools and applications. Health data concerning asthma obtained from Mississippi Department of Health (MSDH) for a year period of 2003-2011, and data of air pollutant concentrations (PM₂.⁵) collected from USEPA web resources, and are analyzed geospatially to establish the impact of air quality on human health specifically related to asthma. Disease mapping using geospatial techniques provides valuable insights into the spatial nature, variability, and association of asthma to air pollution. Asthma patient hospitalization data of Mississippi has been analyzed and mapped using quantitative Choropleth techniques in ArcGIS. Patients have been geocoded to their respective zip codes. Potential air pollutant sources include interstate highways, and other land use data have been integrated in common geospatial platform to understand their adverse contribution on human health. Existing hospitals and emergency clinics are being injected into analysis to further understand their proximity and easy access to patient locations. At the current level of analysis and understanding, spatial distribution of Asthma is observed in the populations of zip code regions in gulf coast, along the interstates of south, and in counties of Northeast Mississippi. It is also found that asthma is prevalent in most of the urban population. This GIS based project would be useful to make health risk assessment and provide information support to the administrators and decision makers for establishing satellite clinics on future.

Observations and Results

Main objectives for this research were, (1) Identify the Asthma disease spatial clusters, (2) Identify promising areas for locating the satellite clinics, (3) Find the underserved and over served clusters of diseased population, (4) Use remotely sensed data (MODIS AOD) to fill the gaps between ground monitors, and estimate the accurate levels of pollutant over study region.

Conclusions
1. Asthma’s impact on the nation, data from CDC national Asthma control program:

References

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Future Work
1. Identify seasonal patterns in pollution and hospital admissions.
2. Establish a quantitative relationship between PM₂.⁵, and Asthma related Hospitalizations.
3. Find the underserved and over served clusters of diseased population.
4. Use remotely sensed data (MODIS AOD)to fill the gaps between ground monitors, and estimate the accurate levels of pollutant over study region.

Spatio-temporal pattern of Pollution
Understand the spatio-temporal nature of disease and it’s relation to air pollution. Healthcare: Identify underserved or over served population.

Study Region: Mississippi
Mississippi State Department of Health

Methods
Asthma Patient Hospitalisation Data
Hospital Network Data and Number of Patient Beds

Data Integration and Analysis
Geocoded to Zip dyCode Boundaries
Geocoded to Sreet lines
Quantitative Choropleth Mapping of Diseased Population

Kriging Technique
PM₂.⁵ Ground data

Geocoded to Zip Code Boundaries

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