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

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Abstract

Study Region: Mississippi

Project Partners

Mississippi State Department of Health

Observations and Results

Asthma Patient Hospitalization Data

Project: Geocoded to Zip Code Boundaries

Project: Geocoded to Sreet lines

PM2.5 Ground data

Kriging Technique

Methods

Data Integration and Analysis

Quantitative Choropleth Mapping of Diseased Population

Geocoded to Zip dyCode Boundaries

Future Work

1. Identify spatio-temporal patterns in population 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/Aqua) to infer changes between ground monitor, and estimate the accurate level of pollutant over study region.

Conclusions

• Asthma related hospital admissions of Jackson urban area has at least 500 to 700 Asthma related Hospital admissions, and this is the highest rate when compared to rest of state.
• Along with increase in population count, the spatial coverage of Asthma is also increased in state over the years and can be inferred from above data.
• 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 in future.

Introduction

1. Asthma is an environmental and economic problem. It’s an expensive disease. Costs United States $56 billion each year (CDC, 2009).
2. A recent survey conducted in United States found out that in any city population, 50% of the adult Asthma patients have higher prevalence of Asthma than those live in suburb regions.
3. The Gad parenthood conducted by Rob., 2003 has found that there is a good connection between Asthma and poverty. They also found that inner city population have higher prevalence of Asthma than those live in suburb regions.
4. Fossey, 2006 has pointed that the long term infection disease surveillance is the identification of spatial clusters of disease, which is significant to plan and provide health care needs to a cluster of diseased population. He also said that time and space play a significant role in dimensioning health GIS delivery.
5. Relationships between Disease and Environmental Factors: A critical review on public health and GIS analysis, 2003 concludes that existing associations between disease sites and exposures to environmental factors is an area of increased interest in GIS and spatial analysis of health data.
6. Al-Hamdan et al., 2009 has estimated daily PM2.5 levels combining both Moderate Resolution Imaging Spectroradiometer (MODIS) data and Environmental Protection Agency (EPA) ground data.

Main objectives of this research were (1) Identify the Asthma disease spatial dyCode areas. (2) Geocoding naming areas for Air pollution (3) Geocoding number of patients are over served or underserved. (4) Investigate the correlation between poverty and pollution. A percent increase in air pollution lead to what percent increase in hospitalization.

References

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

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