The application of Geographical Information Systems (GIS) to map the distribution of tuberculosis cases in the Greater Banjul Area of the Gambia.

MSC Dissertation

By:

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Acknowledgements and affiliations

- **Dr Munir Morad, Kingston University course coordinator for GIS**
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- **The management and staff of MRC Laboratories, The Gambia**

Objective

- To determine the geographical distribution of the Medical Research Council's Tuberculosis Case Contact (TBCC) study cases in the Greater Banjul Area using the GIS technology

Methods (1)

- This MSc Dissertation study was conducted at the Medical Research Council in the Gambia
- 195 TB cases in the MRC TBCC study whose residential address could be traced were recruited into the study
- Using Garmin GPS 12 channel receiver, the coordinates of each patient's residence was taken and this was combined with the associated attribute information collected both from the field and the MRC
- With the base map for the study area, the information was displayed as point themes on the map showing the distribution of cases

Methods (2)

- The government health facilities in the study area were also mapped to determine their concentration in the study area.
- The collected GPS coordinate data were then transferred to map source
- The coordinates were later converted into decimal degrees using a coordinate converter
- The analysis of the data was done entirely on a GIS platform using ArcView 3.1 software in order to create X/Y point themes and shapefiles.

Results (1)

- The results of the mapping process showed a geographical distribution of all the study cases in the study area by treatment status - cured, died, failed treatment, etc.- and by type of TB –MTB and M.africanum.
- The GIS analysis showed a concentration of cases in the residential areas of Bundung.
- 32% of the study participants fall under the age of 25 and only 10% are above the age of 50
- 38% of study subjects have M. africanum type of TB
- There were 17 deaths (8%) of the total study cases which are sparsely distributed in the study area.

Results (2)

- The results of the analysis also showed that cure rate among study participants was high (91%)
- The results of a 0.5mile buffer around each health facility showed a concentration of TB cases around the JFP hospital in Bundung.
- The KMC district has more health facilities than other parts of the study area with one facility (Serekunda Health Centre) managing the diagnosis and treatment of half the total number of TB cases in the whole country.

Discussion & Conclusions

- This GIS study showed that the technology could be used to determine the spatial distribution of TB and other diseases in any setting
- This study therefore showed that using GIS to map tuberculosis may be an effective method for identifying areas with high concentration of TB
- The technology could help public health professionals in knowing the pattern of disease clusters in a particular area
- It can also be used to identify risk populations with information on places with unusually high prevalence of the disease.

Future perspectives

- As a student project, a limited analysis was performed using a fraction of the total number of TB cases in the study area
- We are presently conducting a larger study to determine if clustering of TB occurs in the same area and if this is statistically significant
- This study which has just started will use a combination of GIS and spatial statistical methods (SatScan) in order to identify areas with unusually high increase in the incidence of TB
- The study subjects will include all TB patients registered at all chest clinics in the Greater Banjul Area over a one-year period
- In future, we will use GIS to link with other TB sub-disciplines at the MRC.
- For example, we will seek to identify whether there is clustering at population level of M. africanum, of skin test and ELISPOT positivity in TB case contacts and of drug resistance