

AN ASSESSMENT OF THE SPATIAL RELATIVITY OF HEALTH, LITERACY AND SOCIO-ECONOMIC GROWTH INDEX USING GIS TECHNIQUES: A CASE STUDY ON UDUPI SOUTH WEST COAST OF INDIA, KARNATAKA

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Abstract:

GIS can be thought of as a system that digitally creates and "manipulates" spatial areas that may be jurisdictional, purpose or application-oriented for which a specific GIS is developed. Therefore, in a general sense, the term describes any information system that integrates, stores, edits, analyzes, shares and displays geographic information for informing decision making. GIS applications are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data, maps, and present the results of all these operations. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology. This paper presents the results of using GIS as a tool to study the health status of Udupi District. Health is a parameter that is influenced by various factors both environmental and non-environmental. The thesis, at the latter stage, emphasizes the influence of non-environmental factors such as literacy and socioeconomic index on health status of Udupi district. The results demonstrate an affirmative relation of health status with health literacy, awareness and socio-economic index of a locality, despite the well-knit health care facilities available within the district.

Key Words: Cartography, Statistical Analysis, Geographic Information, Socioeconomic Index

Introduction

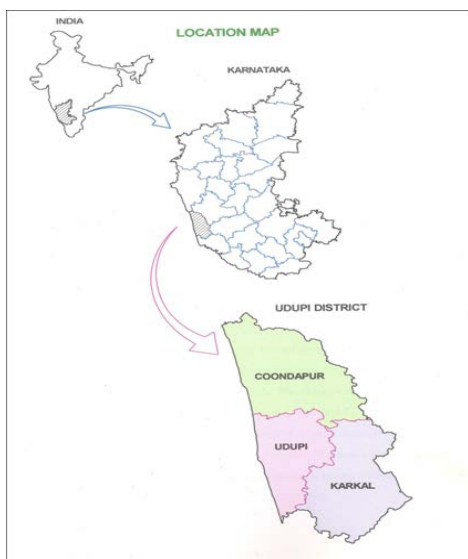
Data encompassing all the fields can be collected, stored and retrieved from such geo-based reference system. Geo-information Technology is a tool by which one can integrate the sustainable indicators easily arriving at suitable modeling and decision making, thereby helping us in evaluating the results and implementing an effective and efficient planning of the project. The health sector is an area that requires continuous monitoring and improvement and the general practice followed to achieve this is by reporting and recording statistical data, conducting studies and drawing probable interpretations directed towards improving the health status.

This is where GIS could be a breakthrough and assist in easier record keeping and interpretation of the data. The end-result would shift the interpretations from single parametric to a multi-parametric relation. Study of the various aspects influencing health can also be done to analyze the root cause of health issues and find permanent solutions. The other aspect that is dealt with in this thesis includes the influence of literacy and socioeconomic index on health. The relationship between literacy and health is complex. Literacy impacts health knowledge, health status, and access to health services. Health status is influenced by several related socioeconomic factors. Literacy impacts income level, occupation, education, housing, and access to medical care. The poor and illiterate are more likely to work under hazardous conditions or be exposed to environmental toxins.

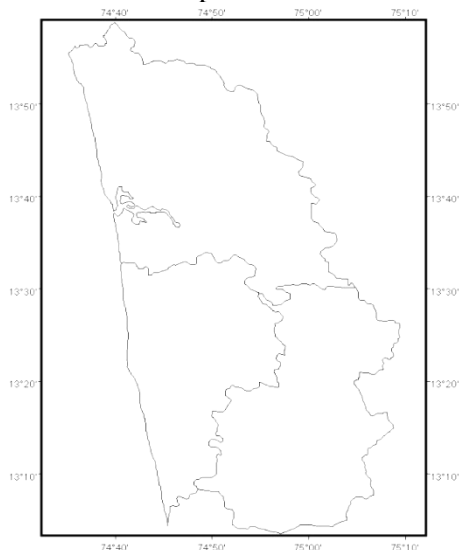
Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. It includes the ability to understand instructions on prescription drug bottles, appointment slips, medical education brochures, doctor's directions and consent forms, and the ability to negotiate complex health care systems. Health literacy is not simply the ability to read but requires a complex group of reading, listening, analytical, and decision-making skills, and the ability to apply these skills to health situations.

Profile Of Udupi District:

Udupi district is a fast growing region of coastal Karnataka along the west coast of India. Udupi district, as demonstrated in Figure 1, lies between longitude 74°35' E to 75°10'E and latitude 13°5'N to 14°N, and falls in the Survey of India Top sheets No.48K/9, 10, 11, 12, 13, 14, 15, 16 and 48O/2, 3, & 4. It is the newly formed district during 1997 having a total geographic area of 3575 sq. km. and population 1,177,908 (2011 census) with three taluks namely Kundapur, Karkal and Udupi,



Source: www.mapsofindia.com



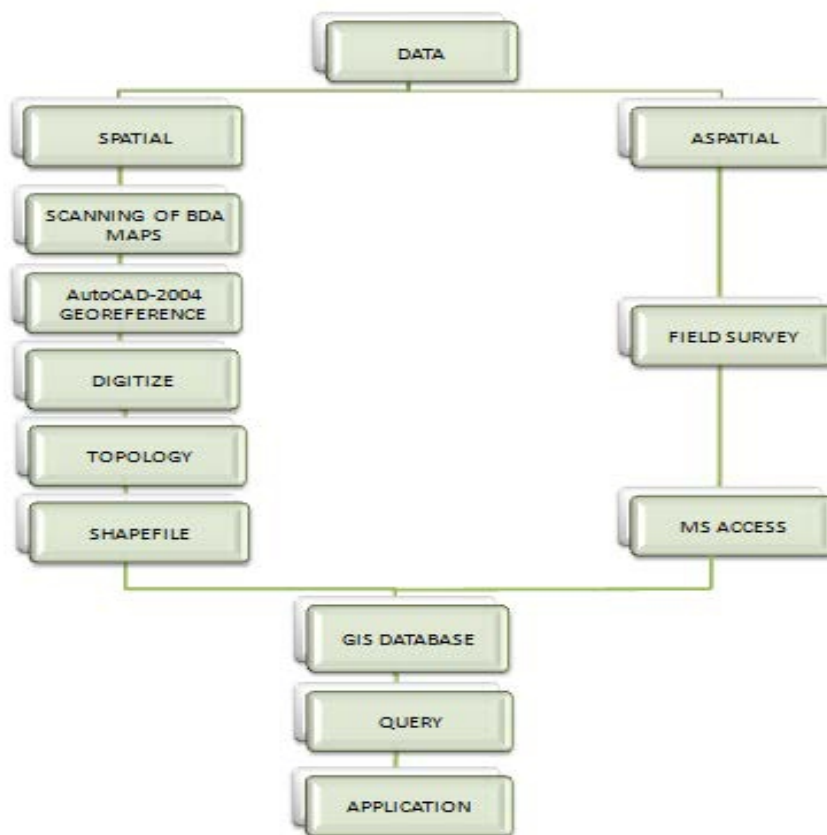
Source: www.mapsofindia.com Figure 1. Udupi District

Methodology:

The project is carried out in the following phases:

- Data Collection
- Base map preparation
- Image editing
- Input of data into individual vector layers
- Preparation of contour maps
- Preparation of intersect Map
- Query Modeling
- Extrapolation of conclusions

Figure 2: Methodology Flow Chart



Query and Extrapolation of Conclusions:

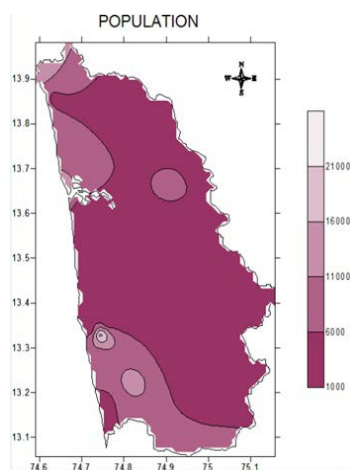
Modeling

Query modeling is done to draw conclusions about the inter-relationship of each parameter. In this step, different query equations are formed which specify certain conditions or limits to each parameter. One can then use the ARC GIS software to find the contours that satisfy the fore given conditions. This step can be used to quote questions and draw conclusions that can be further extrapolated to understand the inter-relationship between the various parameters. Extrapolation is done by studying the various results obtained, comparing with present situation and concluding to find root causes.

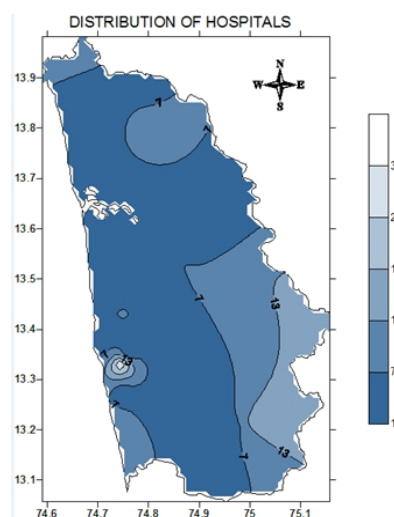
Results:

The stations selected for data collection included: Kollur, Attur, Parakala, Jadal, Kidiyoor, Manipal, Byndoor, Hebri, Brahmavar, Shirva, Shiruru, Kota, Udupi City, Karkala, Herga, Koteswara, Haladi, Paladka, Hosangadi, Someshwara, Kunjibettu, Siddapura, Shankaranarayana, Uchila, Malpe, Katpadi, Kaup, Gangoli, Kumbashi, Belur, Koni and Marvanthe. Primary and secondary data, corresponding to each of the 32 stations, of the various health, literacy and socio-economic index parameters were collected through field work. These data were then input into digitized locations on the base map as individual vector

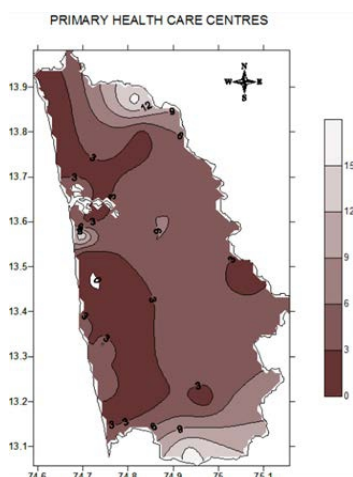
layers. This was done in a GIS environment using the ERDAS IMAGINE 9.1 software. The contour maps were then plotted (Maps 1-6) using GOLDEN SURFER 8.0 software and the following results were observed.



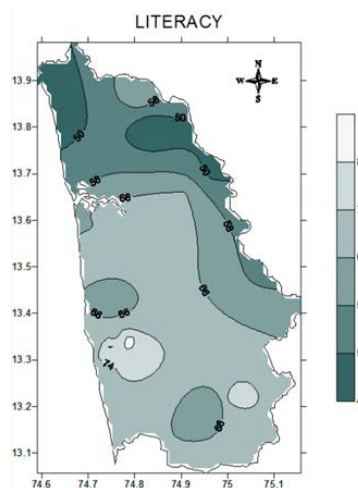
Map 1: Contour map showing distribution of population



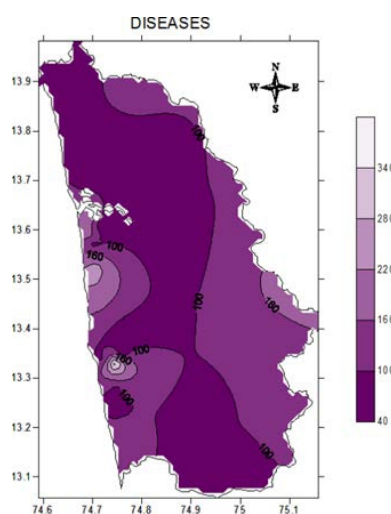
Map 2: Contour map showing distribution of hospitals and clinics



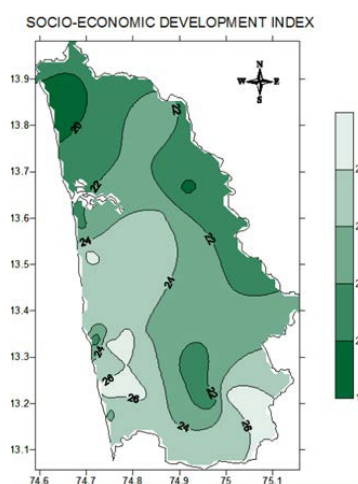
Map 3: Contour map showing distribution of primary health care centre



Map 5: Contour map showing distribution of literacy

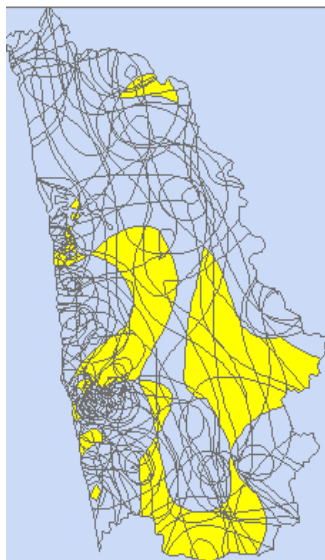


Map 4: Contour map showing distribution of diseases

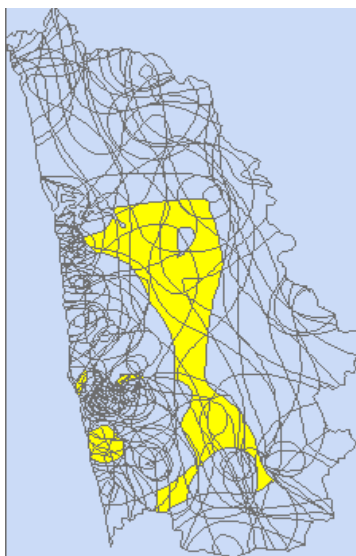


Map 6: Contour map showing distribution of socio-economic index:

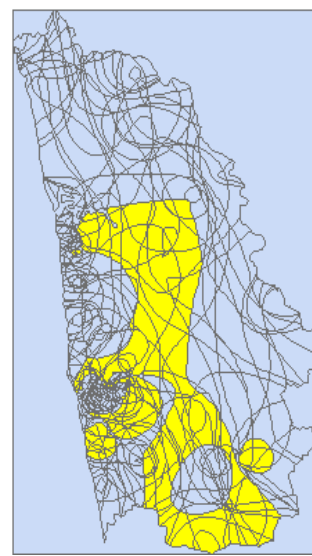
These contour maps were then intersected in ARC GIS 9 software where query modeling was carried out. Contours satisfying the conditions of query were highlighted as shown below



Map 7: Result of Query 1



Map 8: Result of Query 2



Map 9: Result of Query 3

Query 1:

"disease" = '<100' AND "literacy" = '66-74' OR "disease" = '100-160' AND "literacy" = '74-82'

Query 2

"disease" = '<100' AND "SED" = '24-26' OR "disease" = '100-160' AND "SED" = '22-24'

Query 3:

"hospitals_" = '<7' AND "literacy" = '74-82' AND "disease" = '<100' OR "phc" = '3-6' AND "literacy" = '66-74' AND "disease" = '<100'

Discussions And Conclusion:

Udupi district, as can be observed in Map 4, has a good health situation; above three quarters of the district has a low distribution of diseases. This can be explained not only by the well-knit web of hospitals, clinics and primary health care centers but also by the existing literacy and socio-economic index of the district.

However, it can be noted that certain regions of the district, mainly the eastern and coastal areas, have a higher density of diseases. At Someshwara located towards the east of the district such a behavior can be exemplified. Despite having a good distribution of hospitals and clinics the poor health status could be due to the unmistakable fall of both literacy and socio-economic index. Similarly in others areas towards the east, the lack of a fine socio-economic status and literacy could be one of the reasons that diseases are higher even when there is a good distribution of hospitals.

The coastal regions such as Kaup, Malpe, Marvanthe and Kota face health problems due to their location close to the sea. Especially during monsoon seasons and in case of a disease outbreak the coastal area is affected the most due to poor hygiene conditions. The primary health care centers located in these areas must be well equipped to heed to the health demands of such a community.

Udupi city is also observed to have a high density of diseases. This can be justified by its high population and the fact that patients, from all over the district, have a tendency to flock over to Udupi city in search of better and more advanced treatment techniques.

By comparing and carefully analyzing the results of query modeling, it can be concluded that an increased literacy rate and a fine socio-economic status can improve health conditions. Thus along with setting up a good health care system the Ministry of Health must also look into health education. Awareness must be given to the public on the importance of good hygienic conditions and a healthy lifestyle. Also, along with equipping the hospitals and clinics to meet the demands of the local public,

care must be given to equip the public with information about the most prevalent diseases and their symptoms. This way the efficiency of the health care system can be improved and health status of Udupi district can be enhanced.

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