

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Spatial Analysis Tools to Analyze Health Related Problems

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Outline

G/S

- ❑ **Introduction**
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Introduction

GIS

- The inherent characteristic of location component in health makes Geographic Information Systems (GIS) an ideal and sometimes indispensable tool for analyzing health data.
- Case studies demonstrate GIS can be used to monitor tropical diseases, water quality, environmental toxicology, and overall health problems.
- Case studies used in this paper is essentially related to diseases related to water quality and specifically malaria.



Statement of Problem

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- Lots of health problems arise throughout the world due to various reasons and to track all these diseases time and again will be too much of a task in terms of manpower, money, resources and more importantly time.
- Hence, to optimize and solve the problem, customized spatial analysis tools made in GIS by software programmers will help in analyzing and unraveling the dearth of problem and hence time, money, resources and manpower can be saved.

Map Pattern Analysis II
The goal is to make a good generalization about the pattern, such as:
"About 95 percent of the stores are southwest of my line, even though that part of the city has only 40% of the area."

Spatial Association - Making a Visual Estimate
Ask yourself -- do dots seem to be associated more with Area A, Line B, Line C, and/or Area D?
But note, the answer to that question is just a personal opinion - "aseasy" (the visual equivalent of hearsay - not admissible in court!)

SPATIAL THINKING
Think your partner has a term to see a brief explanation of it. Click on a term to go to it and not explore some part of that thinking site.



Objectives

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- The main objective of this paper is to analyze tools related to application of GIS in the field of health. The more important objective is giving a realistic view regarding the implementation of these tools.
- Another objective is to get a realistic view regarding the effective role of decision support system for disease control, especially malaria.
- Last but not the least, objective is to analyse how far spatial data can be effective in developing a model for disease control.



Methodology

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1. The Methodology will include study of literature to find out how GIS was implemented in various parts of the world in the field of its applications in health.
2. Sample tools to demonstrate the use of spatial analysis tools to solve health problems, which include detailed analysis of these tools.
3. Use of Spatial Decision Support System where programming languages are used to link the health related software with GIS for analyzing the decision making.



GIS tools for Health

GIS

- **GIS-EPILINK**: This is a simple spatial search tool that can be used to link environmental and health data when distance between an environmental site and the location of the maternal address of a case or control is used as a proxy for exposure.
- **GATHER**: Geographic Analysis Tool for Health and Environmental Research (GATHER) is an online spatial data access system that provides members of the public health community and general public access to spatial data that is pertinent to the analysis and exploration of public health issues.



GIS tools for Health

GIS

- **HEALTH FACILITY VIEWER (HFV):**
 - The health facility viewer is an informational tool that is available to users with no specific GIS knowledge.

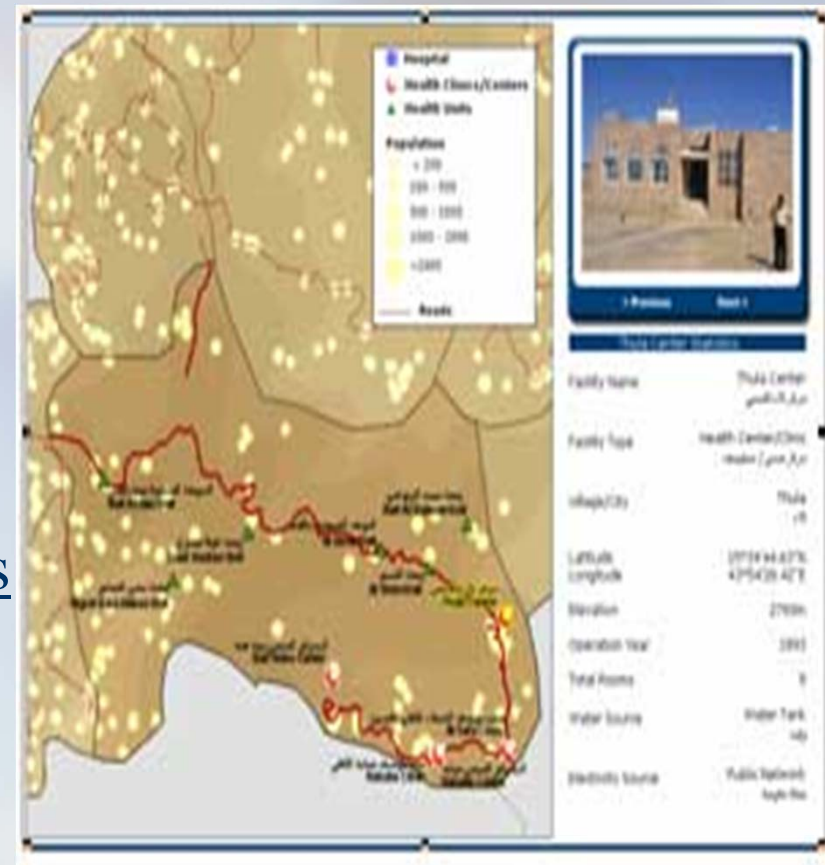
 - It provides a user-friendly interface for viewing the results of a specific Health Facility Survey through map-based navigation.



GIS tools for Health

GIS

- The survey gathered three types of information: the GPS coordinates of the facility, digital photographs of the building's exterior and interior conditions, and information on the facility's staff, conditions, available services, utilities, and financing.



Snapshot of the Prototype Health Facility Viewer



GIS tools for Health

GIS

- Essential Features of HFV:
- ✓ In case of HFV, the user can zoom into a district of interest, and then use the map to select a facility (hospital, health center, or health unit).
- ✓ The survey information for that facility, includes a ‘photo viewer’ that allows the user to flip through the set of facility photos gathered during the survey, as well as tables of information and statistics about the particular facility.
- ✓ At any time, the user can step back to select a different facility within the district, or view a new district.



GIS tools for Health

GIS

- **Spatial Decision Support System (SDSS)**: It is a customized computer-based information system that utilizes decision rules and models and incorporates spatial data.
- Spatial decision-support systems help prioritize dataset development and information gathering and put geographic information in a decision-making context.



SDSS and Health

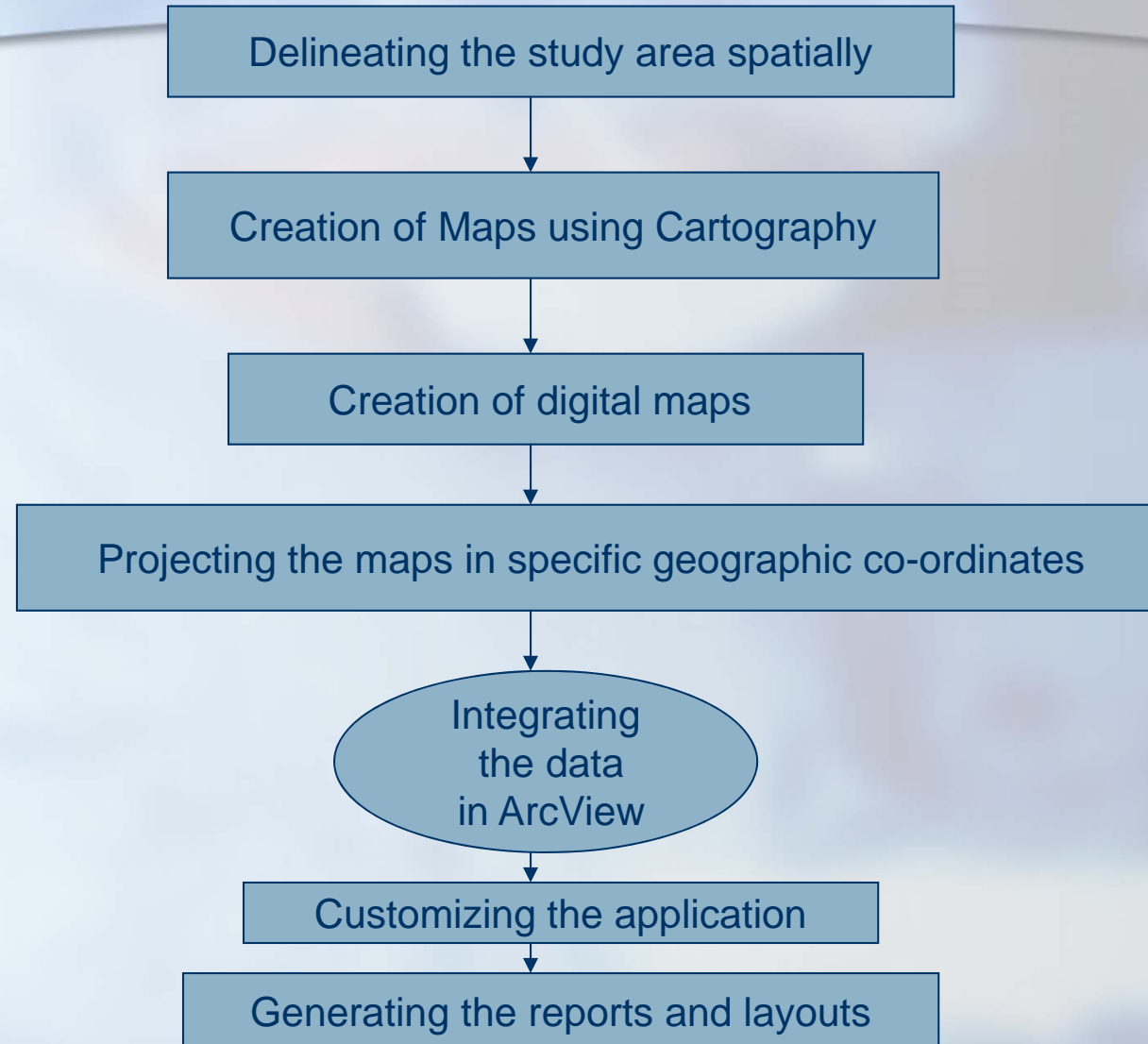
GIS

A spatial decision support system allows a decision-maker to

- (1) build relationships, both spatial and process-based, between different types of data
- (2) merge multiple data layers into synthetic information
- (3) weigh outcomes from potentially competing alternatives
- (4) forecast.

SDSS and Health

GIS





Case Study

GIS

- **Spatial Analysis of malaria risk in an endemic region of Srilanka :**
- Malaria is a major public health problem in Sri Lanka, with almost 300,000 infections being reported yearly in a population of 16 million.
- A combination of factors contribute to the difficulties associated with trying to achieve a reduction in malaria transmission. These include:
 - **Environmental and geographic features of the area**, such as climate, land-use patterns, and development of irrigation schemes.



Case Study (contd...)

GIS

- Factors contd....
 - The movement of people and the creation of new settlements;
 - Behavioral aspects relating to the population;
 - The health care delivery system; and
 - The socioeconomic and educational status of the population
(Ministry of Health 1987-1991).



Case Study (contd...)

GIS

- The objective of this Case study is to monitor human malaria infections occurring in the endemic population in kataragama by paying particular attention to spatial and geographic features of the area.

- **Mapping:**

Scale of Maps : **1:5000**

Aerial photographs taken from altitude : **10,000 m**



Case Study (contd...)

G/S

- **Results** : The results of this Case study indicated that the risk of contracting malaria was on average 2.5 fold greater for resident of rural area (those with poorly constructed house) than the one who lives in a well built house.



Case Study (contd...)

GIS

GIS

✓ **Urban Area**

- ✓ Well constructed houses
- ✓ Away from forest
- ✓ Away from watershed area
- ✓ Less prone to mosquitoes
- ✓ Less risk of Malaria

✓ **Rural Area**

- ✓ Poorly constructed houses
- ✓ Close to forest
- ✓ Near from watershed area
- ✓ More prone to mosquitoes
- ✓ More risk of Malaria



Case Study (contd...)

GIS

- Relevance of GIS to this study:
 - The display of the data pertaining to the study area provided an overview of the malaria incidence in relation to geographically and ecologically important entities.
 - The analysis showed the fact that the better built houses were seen to be spatially clustered around the major roads suggested that house construction type may have confounded the relationship between malaria risk and the two ecological entities – the distances from the forest and watershed area.



Results and Conclusion

GIS

- The results show the successful integration of Health related problems with GIS for better spatial analysis and results.
- This study shows the extensive use of spatial decision support system (SDSS) as a tool for solving problems.
- This study also shows the value of programmer in the GIS field for development of tools to analyze spatial issues.



Results and Conclusion

GIS

- However, as disease transmission in itself is dependent on many ecological factors, many more uses for GIS are envisaged, especially in developing models for disease control.



GIS

THANK YOU