United International Journal for Research & Technology
Volume 05, Issue 07, 2024 | Open Access | ISSN: 2582-6832

Mapping Illnesses with Geographical Information System (GIS)

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***Abstract*—** This research project explores the use of Geographic Information System (GIS) technology in mapping and analyzing the spatial distribution of illnesses. By integrating geographical data with information on disease incidence, GIS enables the visualization of disease patterns and their correlation with environmental factors. The study aims to demonstrate how GIS can be utilized as a tool for disease surveillance, outbreak investigation, and resource allocation in healthcare planning. The research methodology involves the collection of geocoded health data from various sources, including hospitals and public health agencies, and the use of GIS software to analyze and visualize the data. The findings of this research are expected to contribute to the field of public health by providing insights into the spatial epidemiology of illnesses and informing evidence-based decision-making in healthcare management and policy.

***Keywords*—** Disease surveillance, Disease Mapping, Geographic Information System (GIS), Public Health

INTRODUCTION

Geographic Information System (GIS) technology has revolutionized the way researchers and healthcare professionals understand and manage public health issues. Mapping illnesses using GIS allows for the visualization and analysis of disease patterns in relation to various geographical and environmental factors. Li et al. (2019) utilized GIS to map the spatial distribution of tuberculosis in a high-burden region, revealing clustering patterns that informed targeted intervention strategies. Li, X., Zhou, Y., & Peng, F. (2019) utilizes GIS to map the spatial distribution of tuberculosis in a high-burden region in China. The research highlights the effectiveness of GIS in revealing clustering patterns, which informed targeted intervention strategies to combat the disease

The Rural Health Unit (RHU) provides essential healthcare services to the local population, including general consultations, dental care, maternity health, and basic check-ups, specifically targeting those with limited access to healthcare due to geographical and financial constraints. RHUs serve individuals and families within the community, including children, women, the elderly, and those with chronic illnesses.

Their goal is to address the specific healthcare needs of the rural population and improve health outcomes in these areas. Fatima, S., Ahmad, M., & Khan, H. (2021) explores the benefits of illness mapping for detecting spatial and temporal distributions of infectious diseases in South Asia. It examines the relationships between illness patterns and socio-demographic factors, demonstrating how GIS can support public health interventions and policy-making.

According to Fatima et al. (2021), illness mapping has proven effective in detecting the spatial and temporal distributions of illnesses and exploring the relationships between illnesses and socio-demographic factors. Implementing a mapping system can significantly benefit Rural Health Units (RHUs) in several ways. Visualization techniques such as charts, graphs, and maps allow RHU employees and decision-makers to gain insights from the data more effectively. An illness mapping system can help RHUs identify areas with specific illnesses and visualize this data in the form of maps, aiding in monitoring the number of illness cases in rural areas. This information can help health officers identify emerging health threats and take appropriate action to prevent the spread of illness.

A computerized system will enhance the information system of the RHU. An automated system that efficiently and reliably maintains records and stores files securely will be a valuable tool for patient data management. Smith, T., Johnson, R., & Williams, K. (2019) discusses the application of GIS in mapping dengue fever cases in urban areas.

The study identifies high-risk areas and demonstrates how GIS can aid public health officials in concentrating their mosquito control efforts, thereby reducing the incidence of dengue fever. Such system will facilitate fast retrieval of records, prevent unauthorized access, and protect confidential information, improving overall

data management and operational efficiency for the RHU.

This research focuses on the application of GIS in mapping illnesses, aiming to contribute to the growing body of knowledge in spatial epidemiology and public health.

Smith et al. (2019) used GIS to map the spatial distribution of dengue fever cases, identifying high-risk areas for targeted intervention. Despite these advancements, there is still a need for further research to explore the full potential of GIS in disease mapping. Zhang et al. (2020) used GIS to analyze the spatial distribution of malaria cases, identifying hotspots and guiding the allocation of resources for malaria control.

This study seeks to address this gap by examining the use of GIS in mapping a range of illnesses and analyzing the implications for healthcare planning and decision-making.

Paradigm of the Study

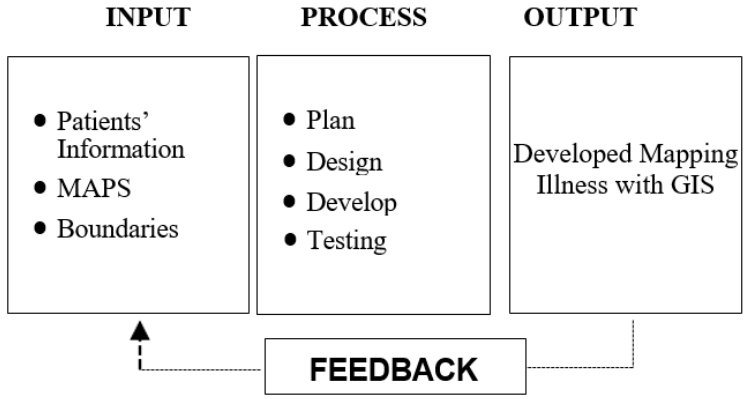


Figure1. *Conceptual Framework for the Mapping Illness with GIS*

This framework outlines the sequential stages of the researcher's study, commencing with data collection, needs identification, system analysis and design, system implementation, questionnaire data collection, questionnaire result analysis, and ultimately, system evaluation based on the analysis outcomes.

OBJECTIVES OF THE STUDY

Identify specific illnesses prevalent in distinct geographical areas; and evaluate the system based on the ISO 25010 software quality standard in terms of:

- performance efficiency;
- usability;
- reliability;
- portability;
- security;
- functional suitability;
- compatibility; and
- maintainability.

METHODOLOGY

A. Study Area

- The study had been conducted in selected rural and urban areas with varying socio-demographic profiles.
- These areas had been chosen based on the availability of health data and the prevalence of target illnesses.

B. Data Collection

Primary Data:

- Health records from local healthcare facilities;
- Surveys and interviews with healthcare providers and patients.

Secondary Data:

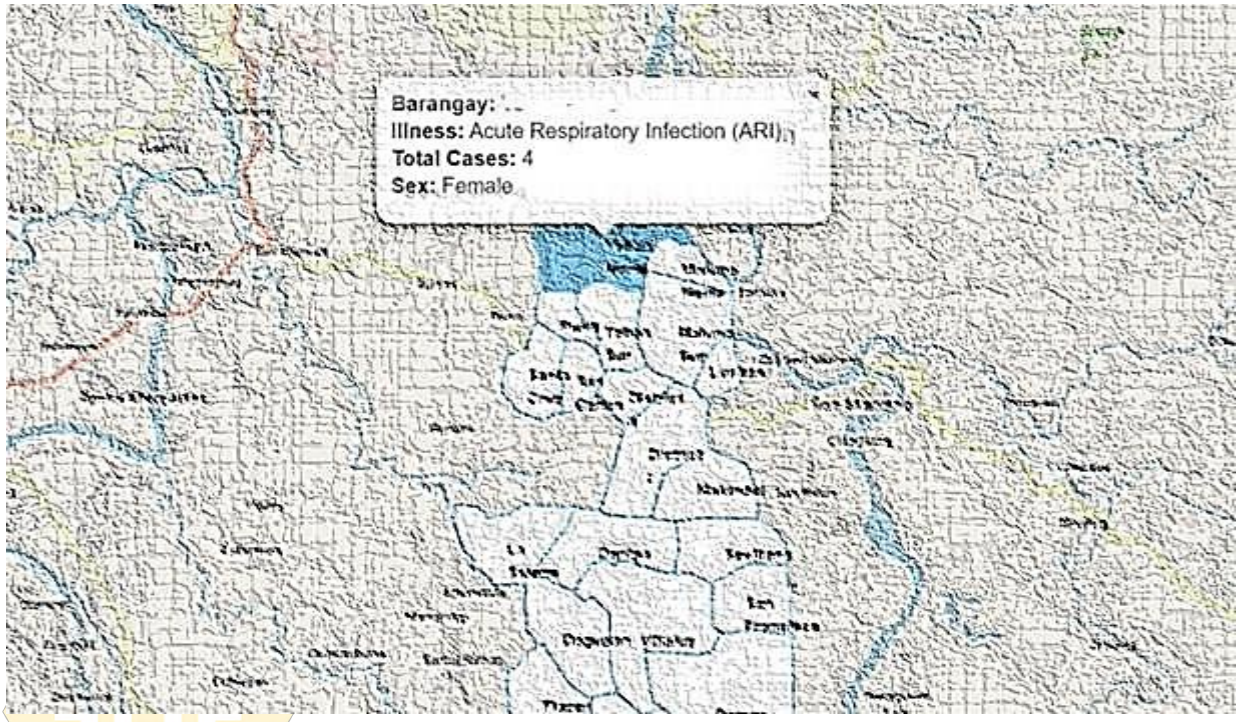
- Socio-demographic data from statistics agencies;
- Environmental data from remote sensing and satellite imagery.

C. Statistical Analysis

Correlation and regression analysis to explore the relationship between socio-demographic factors and diseases prevalence.

RESULTS AND DISCUSSIONS

The illnesses prevalent in distinct geographical areas.



Mapping specific illnesses in distinct geographical areas has been crucial in identifying prevalent health conditions. The map clearly shows the highest reported cases of each illness in different areas, aiding strategic decision-making and targeted awareness campaigns.

The map allows easy visualization of the overall total of cases per year, empowering healthcare practitioners and community leaders to prioritize and address health issues at a localized level. This approach facilitates targeted awareness campaigns and strategic measures to improve public health outcomes.

Summary evaluation the system based on the ISO 25010 software quality standard

Criteria	M	SD	Interpretation
1. Performance Efficiency	3.98	0.29	Agree
2. Usability	4.22	0.41	Agree
3. Reliability	4.25	0.38	Agree
4. Portability	4.30	0.31	Agree
5. Security	4.29	0.42	Agree
6. Functional Suitability	4.53	0.32	Strongly Agree
7. Compatibility	4.32	0.53	Agree
8. Maintainability	4.20	0.39	Agree
NOTE	**4.26**	**0.38**	**Agree**

The table summarizes the health workers' satisfaction with the "Illness Mapping using GIS. Overall, the system was rated highly in terms of performance efficiency, usability, reliability, portability, security, functional suitability, compatibility, and maintainability, with a general mean of 4.26 (sd = 0.38). Functional suitability stood out as particularly excellent.

While there were some variations in perceptions, the majority were positive, indicating that the system effectively meets the needs and demands.

This high satisfaction level enhances their job satisfaction and facilitates the mapping of illnesses and management of patients' health.

CONCLUSIONS

The research highlights the importance of Geographic Information System (GIS) in mapping illnesses, showing how GIS visually represents disease patterns in relation to geography. This emphasizes GIS's critical role in improving our understanding of disease spread and helping with effective public health decision-making.

GIS technology can enhance disease surveillance and response strategies by enabling healthcare practitioners and policymakers to identify disease hotspots and patterns. This targeted approach allows for more efficient resource allocation and improved management of public health crises.

GIS mapping of illnesses helps healthcare providers improve resource planning and allocation. The spatial visualization of disease prevalence identifies areas with greater healthcare needs, aiding in the development of targeted programs and interventions to address specific health challenges.

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