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Review Article

Geographical Information System Utilization in Health Care System of Pakistan

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ABSTRACT

Geographical Information System (GIS) is computer software used for collection, storage, transformation, retrieval and display of geo spatial data from the real GIS world. The geographical data represent the real world in terms of their position with respect to a known coordinate system, their attributes and their geographical relationship with other objects. GIS utilization is being recognized as having the potential to improve the health of that specific population. GIS contributes in policy making, monitoring, implementation, and research in health sector. Need of population according to information provided by the GIS can be determined, which gives a quick and comprehensive review of regional and geographical health problems so that policy makers can utilize this for policy making and for forecasting the epidemics and other community health problems by using GIS. GIS system is a powerful and effective tool for creating intelligent/guide maps for, e.g., location of local health facilities, trauma centers, and specialized hospitals. It's easy to purchase the GIS (hardware and software), but its proper utilization is a big task for the organizations to achieve their specific goals.

Keywords: Geographical Information System, Healthcare system, health software, Pakistan.

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INTRODUCTION

Geographical Information System (GIS) is computer software used for collection, storage, transformation, retrieval and display of geo spatial data from the real GIS world. It is used to provide facilities for data collection, interpretation, management, analysis, and the presentation of geographical data for research and policy making. GIS is not simply software or system for making maps as it can create maps at different scales, in different projects, but it is a tool use for the analysis of collected data.

The geographical data represent the real world in terms of their position with respect to a known coordinate system, their attributes which are not related to their position but contains many information

about that object, such as color, pH, incidence of disease, etc, and their geographical relationship with other objects. This spatial relationship describes how the objects are linked with each other. This study of relationship is known as topology and describes space and geographic properties such as connectivity, which are unaffected by continuous distortions.

Now a day's GIS being used in almost every industry. It is used for education, land and natural resource management, environment and aeronautical applications such as data on

water, rocks, soil, atmosphere, biological activity, information about natural hazards, and disasters collected for a wide range of spatial levels of resolution [1].

GIS is increasingly being recognized as having the potential to improve the health of respected population [2] and contributes in policy making, monitoring, implementation, and research in health sector [3]. The World Health Organization has noted that: "Geographical information systems are of value in the compilation and presentation of data at National and Region-wide levels, particularly environmental data and health outcome data related to the impact and use of health service". [4]. GIS has been successfully applied in many areas of community health. Which includes alerts for the placement of water pumps in villages most infected by Guinea Worm to ensure a safe water supplies [5], and culturally appropriate health promotion material distribution points identification for diabetes literature in a multicultural communities. GIS has also been used in the surveillance and also in monitoring of vector-borne [6] diseases, quantification of lead hazards in a neighborhoods [7], prediction of child pedestrian injuries and analysis of policies and planning of a disease [5,8].

These applications founded integral in the development of priority sectors for interventions for better health outcomes and/or reductions in the cost of service provision respectively; by reducing the prevalence of guinea worm in

villages where pumps were introduced[5], by ensuring that children in high child poverty areas receive meals at low cost whilst at family day care [7], by helping target a culturally-sensitive diabetes program [9], by directing a finite vector control resource to the highest priority response areas during dengue fever outbreaks, by directing lead screening programs to ensure comprehensive screening in high-risk neighborhoods at reduced costs [7], by locating clusters in space and time of child pedestrian injuries [10],and suggesting priority intervention sites. It is clear that GIS technology on its own does not usually deliver better health outcomes. By informing epidemiologists, policy and decision makers, and health workers of the location and geographic relationship between datasets, target existing interventions by using GIS helped to improve the efficacy of the service delivered, or reduce costs associated with the service delivery [11].

Spatial information and public health are so inter-related that Ministry of Health (MoH) of New Zealand announced in early February 2005 that, it was opening a Geo Health laboratory at Canterbury University in a joint venture between the Department of Geography and the Public Health Intelligence group (PHI) of the MoH [12]. Research currently being undertaken by the Geo Health lab included the identification of risk factors or causes leading the New Zealand to the highest incidence of melanoma in the world, assessment of road traffic accident reduction policy initiatives and the ethnic differences in New Zealanders' smoking habits. Recent research has highlighted that smoking is highest among the most socially deprived communities of New Zealand with particularly high rates among Maori.

Similarly, other work with Diabetes New Zealand has found that diabetes rates are significantly higher in New Zealand's poorest communities, and among Maori & Pacific Island communities. Other studies have found that both the exposure to and health consequences of air pollution in Christchurch are far higher in the poorest neighborhoods [12].

This information provides insight for health workers, when developing policies and planning interventions. In collaboration with other departments of government, it could also provide a focus for land use changes, public education about community health problems and solutions, transportation funding, financial reform and political advocacy [12-13]. Despite the fact that modern GIS technology, including software and fast personal computers, are now available for at least a decade before and contains much promise, the incorporation of GIS data, methods and software into public health management and practice is just beginning [14].

GIS is intended to be a means of improving everyday life. Geographical information attaches a variety of qualities and characteristics to geographical locations. These qualify for physical parameters are such as soil moisture, ground elevation, temperature of atmosphere, as well as classifications according to type of vegetation, environmental accidents, floods, water sources (wastewater utilization, storm water etc), etc.

It is easy to purchase the GIS (hardware and software), the system functions only when the requisite expertise is available, the data is compiled, the necessary routines are organized and the programs are properly modified to suit the application, and/or organization's needs [15].

Implications of GIS for Healthcare System in Pakistan

After the literature study we found GIS is a very important and useful tool to facilitate the policy makers, epidemiologists, decision makers to implement the health care policies efficiently and according to the need of that specific area. Trauma Centers can be established where the accident rate is high with the help of Geospatial data. Short and safe passages to approach the specific health facility can be identified by using GIS. By using GIS we can find out the need of population according to information provided by the GIS so it can give a quick and comprehensive review of regional and geographical health problems so that policy makers can utilize this for policy making and event they forecast the epidemics and other community health problems by using GIS.

CONCLUSION

Geographical Information System found as a useful tool for data storage, analysis and presentation in development of health sector and delivery of standard health serves as in other sectors. Demands for data and ways of managing data are growing rapidly across the world. Interest in the potential of GIS in the health sector has increased in recent years, because of its ability to meet immediate, functional and operational needs and to assist in policy making and implementation in health sector.

This study showed that GIS system as the powerful and effective tool for creating intelligent maps for, e.g., location of local health facilities, trauma centers, and specialized hospitals. It is very easy to purchase the GIS (hardware and software), but its proper utilization is a big task for the organizations to achieve their goals. GIS integrates all kinds of information about health system and applications with a geospatial component into a single manageable system. In this way, a benefit of GIS applications is their ability of integration and analysis of all geospatial data to support a decision-making process.

A GIS system has to be built up within an organization according to need of that organization as in health system we need locations of health care facilities, epidemic areas, potentially threat area of epidemics, need of health facilities according to the population number. The integration capacity of GIS technology empowers organizations to make better and informed decision based on all relevant factors. Health department must be aware of the fact that the digital representation of geography is not equal to the existing geography itself, but any digital representation involves some degree of approximation. It is therefore important that the information that results from data

processing be applied to guide the real world in the right direction.

RECOMMENDATION

GIS mapping for the health facilities and teaching hospitals should be done to facilitate the approach of public and the NGO's in case of any disaster or emergency. Epidemic areas marking and regional diseases maps are the need of time to prevent the spread of diseases. Trauma centers mapping is also vital to facilitate the persons and ambulances to reach there by using shortest and safest passage.

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