A REVIEW ON THE ROLE OF HEALTH GIS IN MAPPING AND MONITORING PUBLIC HEALTH

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***Abstract*— The geographic data frameworks in the restorative field (Medical GIS) have turned out to be incredibly valuable in understanding the tremendous picture of general wellbeing. GIS (Geographic Information System) is a helpful apparatus that guides and aids wellbeing research, wellbeing training, arranging, checking and assessment of wellbeing programs that are intended to control and annihilate certain hazardous illnesses and pestilences.**

GIS is being utilized for everything from Urban Planning to promoting, most as of late specialists and researchers are hoping to GIS to gather data in the wellbeing field. We can comprehend the two contrasts and likenesses in populace wellbeing everywhere throughout the world.

Keywords: Geographic Information systems, Health, Eradicate, Epidemics.

I. INTRODUCTION

New diseases and epidemics spread through the total population consistently. The control of geographic data frameworks (GIS) gives a solid stage to our expanding capacity to screen these diseases and recognize their causes. The field of medical topography has an any longer history than most know about, going back to the main known specialist, Hippocrates, and advancing through the 1900s until today. The early history drives us to the examination of contemporary instances of GIS, effects on general wellbeing, space-time mapping segments, and the fate of this order supported by Big Data. The development of medical GIS from early illness maps to advanced maps is a voyage long really taking shape, and keeps on developing. These maps have empowered us to pick up understanding about diseases extending from cholera to malignant growth, all while expanding the information of overall medical problems. As present day innovation keeps on flourishing, medical GIS will remain an enduring methodology for getting populaces and the world we live in.

Health/Medical Geography:
Healthcare and disease is distributed spatially by Geography of disease and Geography of health care systems.

II. HISTORY

Fig. 1 Water source responsible for an outbreak of cholera in London

Dr. John Snow, often credited as the father of the study of epidemiology, is arguably the most well known of those models. Dr. Snow utilized a hand-drawn map to break down the geographic areas of deaths related with cholera in London in the mid-1850s. His map, which superimposed the areas of cholera deaths with those of open water supplies, pinpointed the Broad Street siphon as the in all likelihood wellspring of the cholera episode. Expulsion of the siphon handle prompted a quick decrease in the occurrence of cholera, helping the medical network to in the end reason that cholera was a water-borne sickness.

Dr. Snow's work provides an indication of how a GIS could benefit public health investigations and other research. He continued to analyze his data, eventually showing that the incidence rate of cholera was also related to local elevation as well as soil type and alkalinity.

III NEED FOR GIS

The present general medical issues are a lot bigger in extension than those Dr. Snow confronted, and specialists today rely upon current GIS and other PC mapping applications to aid their investigations. For instance, the guide portraying demise rates from coronary illness among white guys above age 35 in the US somewhere in the range of 2000 and 2004.

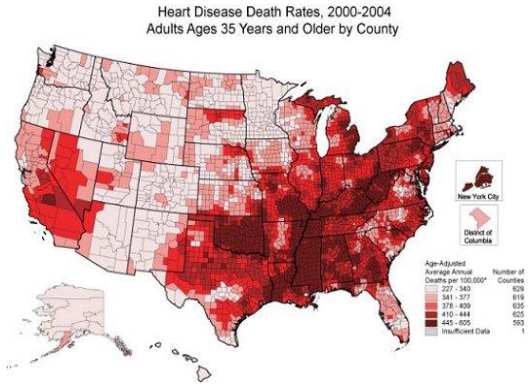

Fig. 2 Heart disease death rates (2000-2004)

With this GIS one can see patterns and epidemics and work towards taking care of these medical issues before they deteriorate. As per the Environmental Science Research Institute (ESRI), GIS assumes a basic job in figuring out where and when to intercede, improving the nature of consideration, expanding openness of administration, discovering more financially savvy conveyance modes, and protecting patient secrecy while fulfilling the requirements of the exploration network for information availability.

IV GIS OPERATION

For the most part, the goals of GIS are the administration (obtaining, stockpiling and support), investigation (factual and spatial demonstrating) and show (illustrations and mapping) of geological information and subsequently delivering important outcomes. The strategies which for the most part apply to wellbeing related examinations utilizing GIS incorporate overlay investigation of topical information and spatial crossing point, cushion age, neighborhood investigation, vector-based matrix age, arrange investigation and raster surface demonstrating. It is an important device to aid wellbeing research, wellbeing training, arranging, checking and assessment of wellbeing projects and wellbeing frameworks

By making of cradle zones, it is conceivable to design or research the events of diseases around critical areas for which arranging of new/extra wellbeing offices are required. The client can indicate the span of the support and afterward cross or consolidation the data with the infection occurrence information to decide the tallies of the ailment that fall inside the zone.

Further, the expository apparatuses accessible inside GIS make it conceivable to coordinate an assortment of elements that impact the spread and improvement of the sickness. Specifically, these elements identify with enumeration information, monetary and socio-social attributes of nations or areas that influence the example and improvement of such diseases. Monetary components incorporate future, pay, sexual orientation disparity, and work versatility. Socio-social factors incorporate training, religion, the ethnic piece of a populace and the sort of living condition. Different variables are the age of the pandemic, the sorts and accessibility of medicines and sexual practices.

A. The study of geographical distribution of diseases can have a variety of uses and can fit into any of the three classes:[3]

1) *Disease mapping* – usually the object of the analysis is to provide (estimate) the true relative risk of a disease of interest across a geographical area. Application of such methods lies in health service resource allocation.

2) *Disease clustering* – this aids in public health surveillance, to decide where it may be important to be able to assess whether a disease map is clustered and where the clusters are located. The analysis of disease incidence around a putative source of hazard is a special case of cluster detection.

3) *Ecological analysis* – this focuses on the analysis of the geographical distribution of disease in relation to explanatory covariates, usually at an aggregated spatial level.

A. Data mining

Another test in the field of drug is information revelation from the developing volume of information. Social insurance is an information concentrated space in which neither information gathering nor information examination can be fruitful without utilizing learning about both the issue area and the information investigation process. A large portion of these applications are specific and include singular AI method, for example, information mining. Information mining, otherwise called "learning disclosure in databases", is the way toward finding fascinating examples with regards to databases that are important in basic leadership and is likewise an application zone that can give huge upper hand to an association . It is worried about discovering models and example from the accessible information. Information mining incorporates prescient information mining calculations, which result in models that can be utilized for expectation and arrangement, and clear information digging calculations for finding intriguing examples with regards to the information, similar to affiliations, bunches and subgroups [4].

V. INCIDENCE AND PREVALENCE

Incidence and prevalence are two progressively vital establishments for utilizing GIS in general wellbeing applications. Incidence analyzes the quantity of new instances of a sickness or medical problem over a particular timeframe (Cromley and McLafferty). Prevalence is the incidence of existing instances of an ailment over a particular timeframe (Cromley and McLafferty). These are essential to GIS applications in light of the fact that a sickness that has a quick demise rate will have a higher incidence than prevalence in a network and GIS can enable scientists and wellbeing authorities to see the dispersion of destructive maladies and conceivably discover a source.

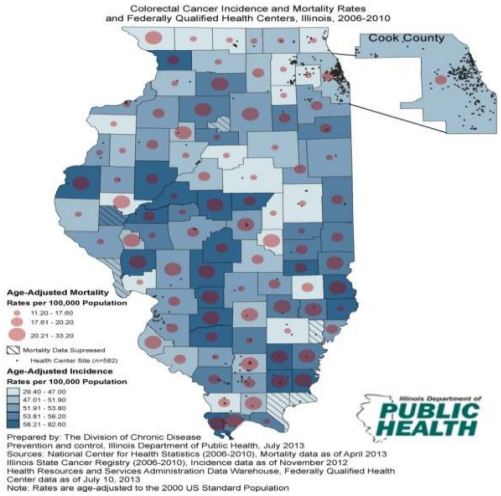

Fig. 3 Colorectal Cancer Incidence

VI GIS STUDIES ON HIV/AIDS

AIDS or (AIDS) is an accumulation of symptoms and infections coming about because of the particular harm to the invulnerable framework brought about by the human immunodeficiency infection (HIV) in people. The late phase of the condition leaves people defenseless to artful infections and tumors. Most scientists trust that HIV originated in sub-Saharan Africa amid the twentieth century, it is presently a pandemic, with an expected 38.6 million individuals currently living with the infection around the world. As of January 2006, the Joint United Nations Program on HIV/AIDS (UNAIDS) and the WHO gauge that AIDS has slaughtered in excess of 25 million individuals since it was first perceived on June 5, 1981, making it a standout amongst the most ruinous pandemics in written history. An expected 33 million individuals were living with HIV in 2007.

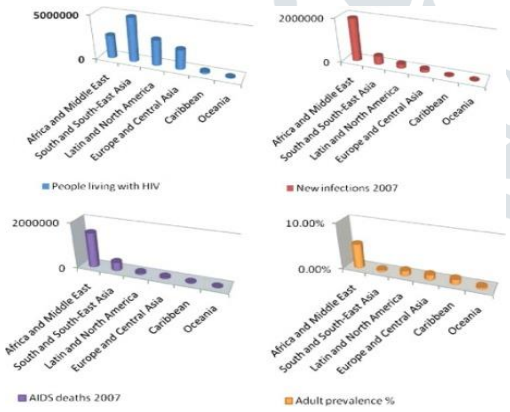

Fig. 3 Graphs Indicating HIV affected people and AIDS deaths.

There were 2.7 million new HIV infections and 2 million AIDS-related passing in the year 2007. The rate of new HIV infections has fallen in a few nations, yet all inclusive these positive patterns are in any event mostly balanced by increments in new infections in different nations. Internationally, ladies represent half of all HIV infections – this rate has stayed stable for as long as quite a long while. The worldwide level of grown-ups living with HIV has leveled off since 2000. In for all intents and purposes all districts outside sub-Saharan Africa, HIV excessively influences individuals who infuse drugs, men who engage in sexual relations with men and sex laborers.

VII. CURRENT ADVANCEMENTS

A. *BIG DATA*

One of the present progressions in the fields of Medical GIS is originating from our expanding capacity to gather and dissect mass measures of data, a marvel known as Big Data. "Enormous Data alludes to datasets whose measure is past the capacity of average database programming apparatuses to catch, store, oversee, and break down".

Enormous Data will extend "from couple of dozen terabytes to numerous petabytes (a huge number of terabytes)". Since GIS joins spatial investigation with accessible information, using substantial informational indexes could inevitably give us forward-thinking data on medicinal and social patterns. Informal communication is just a solitary one of the sources releasing a lot of information under the control of restorative geographers.

Notwithstanding population wellbeing, GIS is broadening its concentration into present day social advancements so as to exploit vast datasets. "GIS give an advanced focal point to investigating the dynamic associations between individuals, their wellbeing and prosperity, and changing physical and social situations [2]. It is accounted for that 340 millions tweets are sent for each day (about 4,000 tweets for every second) and in excess of 901 million Facebook notices Although just a small amount of these online-web-based social networking exercises are geo-situated, by mining wellbeing related geo-found tweets, space-time examinations of these tweets can gather spatial-worldly examples of infection transmission.

Therapeutic GIS is a connection among biomedical and sociologies. The interest for GIS in the wellbeing field parallels the progressions in ailment control. It is a significant methodology, which recognizes and maps restoratively powerless populations, wellbeing results, hazard factors and the connections between them. The limit of GIS to connect sickness data with natural and spatial information makes it an advantage in the movement of overall social insurance. Moreover, wellbeing associations would now be able to picture, break down, decipher and show multifaceted geo-area information using GIS devices, mapping applications and Big Data. These new instruments have released new displaying methods recently thought unimaginable. Proceeding with developments in GIS and Big Data make this an energizing time for therapeutic GIS, and it will intrigue observer how new advances, diagnostic systems, and information sources will shape the eventual fate of the control.

VIII. DATA TYPES AND MAINTAINING PRIVACY

Since GIS has such a large number of various uses in public health there is additionally a wide assortment of information types accessible for research. The United States' Centers for Disease Control and Prevention records a few unique sources on their site. This information comprises of data from the U.S.

Enumeration Bureau, the Organization and the Pan American Health Organization [1] among others. This information incorporates themes, for example, AIDS, air quality, diabetes commonness, malignant growth studies and measurements and baby death rates. This is all information that is right now accessible and can be utilized for research purposes and foundation examines. New GIS information can likewise be made in the midst of crisis.

In spite of the fact that there is a plenty of GIS information accessible for public health applications quite a bit of it manages delicate data and all things considered protection and classification of people is a huge worry among specialists. Accordingly precautionary measures must be taken while making maps with the goal that people are not recognized dependent on the spatial information. Educated assent, the utilization of littler guide scales, geographic trait concealing and address counterbalances are all approaches to build privacy.

ADVANTAGES

- Work flow and productivity improvement in health.
- Build up a reference information base-GIS health layer for Srilanka
- Efficiency improvement
- Decision making support
- Performance and account taking support
- Generation of revenue
- Social content

DISADVANTAGES

There are a few issues with utilization of GIS apparatuses for public health endeavors. These are the worry about security and classification of people. Public health is worried about the health of the populace overall, yet should utilize information on the health of people to make a considerable lot of those appraisals, and securing the protection and secrecy of those people is of central significance. Utilization of GIS shows and related databases raises the capability of trading off those protection gauges, so a few precautionary measures are important to abstain from pinpointing people dependent on spatial information. For instance, information may should be amassed to cover bigger territories, for example, a postal division or region, veiling singular personalities. Maps can likewise be developed at littler scales so less detail is uncovered. On the other hand, key distinguishing highlights, (for example, the street and road arrange) can be left off the maps to veil accurate area, or it might even be prudent to deliberately balanced the area markers by some irregular sum whenever esteemed vital.

It is entrenched in the writing that factual derivation dependent on totaled information can lead analysts to incorrect ends, proposing connections that in actuality don't exist or darkening connections that do in certainty exist. This issue is known as the modifiable areal unit issue. For instance, New York public health authorities stressed that disease bunches and causes would be misidentified after they were compelled to post maps indicating malignant growth cases by ZIP code on the web. Their statement was that ZIP codes were intended for a reason disconnected to public health issues, thus utilization of these subjective limits may prompt wrong groupings and after that to off base ends.

CONCLUSION

Medical GIS is a link between biomedical and social sciences. The demand for GIS in the health field parallels the advancements in disease control. It is an invaluable approach, which identifies and maps medically vulnerable populations, health outcomes, risk factors and the relationships between them. The capacity of GIS to link disease information with environmental and spatial data makes it an asset in the progression of worldwide healthcare. Additionally, health organizations can now visualize, analyze, interpret and display multifaceted geo-location data through the use of GIS tools, mapping applications and Big Data. These new tools have unleashed new modeling techniques previously thought impossible. Continuing innovations in GIS and Big Data make this an exciting time for medical GIS, and it will be interesting to witness how new technologies, analytical techniques, and data sources will shape the future of the discipline.

ACKNOWLEDGMENT

We extend our sincere thanks to our Head of the department Mr. Needhidasan.

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