From Vision to Action
towards better health service planning: difficulties & prospects

GIS/Remote Sensing & GPS Application in Health
By
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Outline Of Presentation

- Vision & Action
- The Key actions
- Technologies available
- Illustrations
- Difficulties
- Prospects
Vision relates to setting up goals or probable outcomes of the programmes.

In order to achieve goals, strategic actions would be required and actions are always linked with space (Place, where?). For instance one of the key goal of health programs is to make essential health services equally available, accessible to all individuals and communities. Both availability and accessibility are linked with the space.

The space component which links vision to action and vise versa is effectively handled by the GIS (Geographical information system) technology.

GIS has tremendous use in health where 90% data have spatial component in it i.e. availability, proximity, coverage etc.`
Key actions

- Rationalization of health resources.
- Effective communicable disease control & Tracking the discerning patterns
- Disease alerts local, regional, global.
- Development of need based health plans.
Technologies available

- Geographical Information System
- Remote Sensing
- Global Positioning System
GIS is a system for input, storage, processing and retrieval of spatial data. New database (spatial/Non-spatial) could be prepared using intersection, union, clip, merge etc operations on the base maps.

GIS Advantages
• Easy map preparation & Voluminous data handling
• Integration of spatial and non spatial information
• Query generation and retrieval of information
HEALTH FACILITY BUFFERS FOR PLANNING THE OUTREACH SERVICES

Names of far-off slums

<table>
<thead>
<tr>
<th>Point</th>
<th>Distance</th>
<th>Slum Name</th>
<th>Population</th>
<th>Outreach Services</th>
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<tr>
<td>1</td>
<td>0.000</td>
<td>Chhindwara Bapunath 0000</td>
<td>350</td>
<td>500 Moderate</td>
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<td>975 High</td>
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<td>Ghati Bari (Ghati Bari)</td>
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<td>5</td>
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<td>6</td>
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<td>1500 Moderate</td>
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<tr>
<td>7</td>
<td>0.060</td>
<td>Kesar Vihar (Kesar Vihar)</td>
<td>1500</td>
<td>1500 High</td>
</tr>
</tbody>
</table>

Maps credit: UHRC
Remote Sensing is the science of acquiring information (spectral, spatial, temporal) about material objects, area, or phenomenon, without coming into physical contact.

**Satellite data Advantages**
- Getting the topographical information.
- Getting the temperature data
- Tagging the borders and trade corridors
- Transmission of disease alerts
Remote Sensing?

Identifying districts / countries at risk of importation of the virus

Helps in estimation of populations at greatest risk & planning cross border intervention.
Intersection of outbreak map with the trade corridor will inform decision maker

Identification of borders to be sealed.

Tagging the trade corridors
Identification & tagging the sites of mass gathering e.g., Bus, railway station
The Global Positioning System (GPS) is a space-based radio-navigation system that provides reliable positioning, navigation, and timing services.

**GPS Advantages**

- Pinpointing the epicenter of disease
- Mapping of health facilities
- Linking the location with GIS maps & Satellite data for sending alerts globally.
GPS utilization in sending disease alerts globally

Visualization of outbreak at the remote location

Capturing GPS data at infected area & uploading on Google Earth
Illustrations
A resource rationalization pilot study was conducted in 2 districts (Shimla and Kangra) of H.P. by DoHFW. In both the districts though number of health facilities in place were more than the norms in terms of population coverage but it was found that they were illogically distributed.

Methodology:
Key Findings
GIS based Health Information System

Depiction of PHCs linked with CHC-Kangra (Gangath Block)
GIS based Health Information System *Contd.*

Depiction of Villages linked with SC-Kangra (Shahpur Block) H.P.

### Statistics Details

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*Map credit EPOS Health India Ltd*
Decision on Selection of 24 Hour Services
Decision on Selection of 24 Hour Services
Decision on Selection of 24 Hour Services
2: GIS/RS application in diseases management

- Geographical display of Epicenter of disease on map helps in quarantining the area which is very important aspect of disease control measure.

- Describing the distribution of disease correlates i.e previous outbreaks, poultry farming sites, trade corridors, wet lands etc. helps in vulnerability assessment.

- Using maps, rapid response teams could be effectively mobilize from control room to the infected areas. Also the quick updation of maps provide opportunity to monitor various efforts from remote locations.

GIS is particularly well suited to enhance risk assessment for pandemic diseases.
Depiction of Malaria incidences in Trans Yamuna Region (Allahabad District)
Depiction of Malaria incidences in Trans Yamuna Region (Allahabad District)

Village-wise Slide Positivity Rate (Malaria) of Trans-Yamuna Region

2002

2004
Pinpointing areas where surveillance should be intensified helps in sending the disease alerts to neighboring districts.
Vulnerability categorization on the basis of Composite Index

Legend

SHDI

- LOW
- MODERATE
- HIGH
- NO DATA

Mapping of Social Health Development Index

Map credit: NIMS
Identification of the alarming trends in demography

MAJOR AXIS OF POOR SEX RATIO IN PANIPAT DISTRICT
(Villages with < 800 sex ratio in pink color)
Pattern of change in the sex ratio of 0-6 population-District Panipat

1991

2001

VERY ALARMING

Legend:
- 1 - 550
- 551 - 650
- 651 - 750
- 751 - 850
- 851 - 950
- 951 - 1050
- 1051 - 1150
- No Data
Utilization of GIS maps provide critical inputs in health plan preparation as it effectively communicate and reflect following.

- **Is the plan including all?** By its capacity to capture, update and highlight the location of slums, migratory population etc. spatial mapping effectively communicate whether plan is including all or not.

- **Is the plan identifying where the need is maximum?** By indicating the location (where) of various phenomenon (i.e. vulnerable population, unmet need of health services, disease pattern, environmental condition) spatial mapping helps in pinpointing the major health concerns.

- **Are the resources or facilities optimally utilized?** By facilitating in depicting the degree to which facilities being utilized, maps measure the productivity of existing resources. This helps in identifying facilities to be strengthened, relocated, downgraded or close down.
Large number of Invisible and Un-counted population

LOCATION OF SLUMS – MERRUT CITY

Map credit UHRC

LEGEND
- LISTED SLUM 102
- UNLISTED SLUM#5
Population distribution is critical in health planning.
Redemarcation of catchment area is vital for optimal utilization of health resources & effective implementation of urban health programmes.
Referral system need to be established in urban areas

Public Health Facility Distribution - Haridwar City

Map credit UHRC
Usage of GIS in Health

Difficulties Faced

- Problem with Nomenclature due to Unavailability of unique identification
- Inconsistent information
- Multiple Stakeholders Various information channels
- Difference in norms & actual status
- Information related to Target group is not updated regularly
- Lack of understanding of spatial concepts & weak negotiation capacity
- Sometimes Health blocks/ Administrative block Tehsil makes system complex & confusing

Limited Impact/ Low up Scalability
Prospects

- GIS can assist in establishing effective governance as it promote evidence based planning & organizing health service delivery on the basis of population and distance.

- GIS can be used for increasing the HMIS capacities by integrating to other techniques i.e. Remote sensing, GPS, Mobile, telemedicine.

- GIS maps (in the local language) in printed form can be used as awareness generation tool to demand and access health services. Clear-cut demarcation & visualization of catchment areas facilitate in establishing a logical referral system.

- GIS based HMIS can be synchronized with other programs i.e IDSP, JNNURM, UIP etc to develop integrated strategies for coordinated implementation.
GIS is a action support tool.

Many thanks.........