Improving Health Care Systems Using Geographic Information Systems (GIS)

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Overview

▲ Why use GIS? How it works?
▲ Data Requirements
▲ Example Health GIS Applications
▲ Analytical Considerations
▲ Potential Implications
Why Use GIS in Developing Countries?

- Important role in public health – strengthening health systems
- Variation in health care needs are influenced by a variety of factors
- Ability to analyze health data in a clear, convenient, and easy to comprehend form
- Ability to convey information visually
- Ability to geographically link health data with population characteristics, environmental conditions, and health care conditions
How Health GIS Works

- Includes surveillance systems, surveys, and health information systems

- Common reference points are geographic locations such as health facilities, settlements, districts, road networks, streams, and other spatial references.

- GIS tools enable public health professionals to overlay their health information on a map for visualization and analysis.
Base Data Requirements

Base Map Data Layers
- Administrative boundaries
- Road network
- Elevation data
- Hydrography
- Land Use

Population and Demographics
- Critical information for developing health indicators and all types of analyses
- 2005 Census
Health Facilities
- Status and location of ALL health facilities is unknown
- Implement 2004 Health Facility Survey
- Supplement survey data with use of digital photographs & GPS coordinates

Health Information Systems (HIS)
- Consistency begins with developing data standards
- Determination of essential elements or indicators
Sample Health GIS Applications

- Availability and access to health care
- Targeting resources
- Analyze program interventions
- Registry mapping
- Disease Surveillance
- Promote awareness
- Evaluate population groups at risk
- Assess equity and efficiency of health service delivery
- Integrate with Health Information Systems to support evidence-based decision making
Health GIS Efforts in Yemen

- Held workshop in February 2004 to bring together the Yemeni GIS user community
- Ongoing collection of health-related data
- Built base Health GIS
- Providing support to the MOPHP with health sector donor mapping
- Developing customized health GIS analyses
- Assist the Ministry of Health with implementing the Health Facility Survey
- Deliver technical support to select Governorates
- Designing new Ministry of Health Website
- Implementing HIS in pilot health centers
Health Care Accessibility Areas

Republic of Yemen
Large Health Facility Accessibility

- Large Health Facilities
  - Hospitals/Clinics (40+ rooms)
- Medium Health Facilities
  - Hospitals/Clinics (25 - 39 rooms)
  - Distance from large health facilities (25 km)
  - Distance from large health facilities (50 km)

Population density (inhab/sq km):
- Less than 10
- 10 - 49
- 50 - 99
- 100 - 175
- More than 175 (max = 29.458)

Towns with population > 2000
Donor Mapping

Distribution of Governorate-specific Projects by Type

Project Type:
- Facility/Infrastructure Support
- Health Education
- Reproductive Health/Family Planning
- Training
- Disease Control
- Health Policy/Program Management
- Technical Assistance
Relative Levels of Donor Contributions to USAID Governorates of Interest

Donor Contributions:
- USAID/BHE
- DIA
- GTZ
- German Leprosy & TB Relief Assoc
- Netherlands Embassy
- OXFAM
- USAID/PHRplus
- SFD
- UNICEF
- USG 416(b)
- WHO
- JICA
- UNDP
- Family Health/Family Planning
Spatial Patterns of Outbreaks

Rift Valley Fever (RVF) Outbreak in 2000

- Deaths from RVF (166)
- Cases of RVF (1328)

Presence of RVF in Governorate:
- In humans and animals
- In animals only
- No presence

Sample map based on information available at: http://www.who.int/csr/disease/riftvalleyfev/countrysupport/en/
Integrating Health Information Systems (HIS) with GIS

- Standardization of facility-level health statistics data collection
- Simplify process and provide adequate training
- Improve data collection efficiency
- Provide a “feedback intervention” for creating continuous process of evidence-based health care pattern improvements
Targeting Program Interventions

Yemen Health Information System - Query Form

Select Governorate to Query: Mareb

Locate all Districts where:

- Total Number of Health Employees
- Number of Physicians
- Number of Nurses
- Number of Midwives

is less than 10 per 10,000 people.

Run Query
<table>
<thead>
<tr>
<th>Source of electricity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Main network</td>
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</tr>
<tr>
<td>2 Cooperative network</td>
<td></td>
</tr>
<tr>
<td>3 Private network</td>
<td></td>
</tr>
<tr>
<td>4 Generator</td>
<td></td>
</tr>
<tr>
<td>5 No electricity</td>
<td></td>
</tr>
</tbody>
</table>

**Medghil Al-Jeda’an Health Center**

<table>
<thead>
<tr>
<th>Facility Name:</th>
<th>Medghil Al-Jeda’an</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governorate:</td>
<td>Mareb</td>
</tr>
<tr>
<td>Facility Type:</td>
<td>Health Center</td>
</tr>
<tr>
<td>Ownership:</td>
<td>Government</td>
</tr>
<tr>
<td>Year Opened:</td>
<td>1997</td>
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<tr>
<td># of Staff:</td>
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<td># of Rooms:</td>
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</tr>
<tr>
<td># of Useable Toilets:</td>
<td>4</td>
</tr>
<tr>
<td># of Telephone Lines:</td>
<td>1</td>
</tr>
<tr>
<td>Electricity Source:</td>
<td>Generator</td>
</tr>
</tbody>
</table>
Welcome

Our mission is to promote health and quality of life by preventing and controlling disease, injury, and disability.

Highlights

- **MoPHP Announces New Goals and Organizational Structure.** Learn more about the new health goals and integrated operations that will allow MoPHP to have a greater public health impact... [more]

- **The National Malaria Project** has reached out to thousands of children and prevented numerous malaria cases. Protect your child. Contact your local health clinic today... [more]

- **Childhood immunization rates** are steadily increasing with the implementation of the Extended Immunization Program. View the statistics by selected governorate... [more]
Overcoming Barriers

⚠️ Data collection can be an enormous undertaking

⚠️ Relying on existing data sources can be problematic

⚠️ Integrating data from a variety of sources often requires extensive efforts to clean and convert the data into a useable format.
Potential Implications of Using Health GIS

- Reveals relationships and trends that might not be evident when the data is viewed in tabular format
- Innovative framework for accessing, integrating, visualizing and utilizing health data to inform decisions
- Illustrates evidence-based rationale
- Moves beyond basic mapping capabilities toward sophisticated, robust spatial analyses
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