GeoHealth – Toward an Integrated Community, Provider, and Insurer Perspective

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Authors

Thomas A. Horan, Ph.D.
Professor, CISAT Director

Michael McElroy
Information Systems and Technology
M.S, MBA, Ph.D. Student

Brian N. Hilton, Ph.D.
Clinical Associate Professor,
Director, Advanced GIS Lab
Topics

Health Geoinformatics Overview and Model

GeoHealth for Community, Insurer, and Provider

GeoHealth Integration and Directions
Example: Doctor Hotspot

http://video.pbs.org/video/2070853636/
**A Conceptual Model for Health Geoinformatics**

GIS has the capability to inform health through:

- Informing and educating professionals and the community
- Empowering decision making
- Planning for clinical cost effective decisions
- Prediction of health outcomes
- Determining priorities with limited resources
- Changing health and management practice
- Monitoring and analyzing changes

GeoHealth Applications Platform

Mission:

Create a GeoHealth Applications Platform that utilizes real-time, spatially-enabled, health information to:

- Influence strategic resource healthcare planning,
- Support high-quality healthcare delivery, and
- Meet the healthcare needs of a diverse population
GeoHealth Applications Platform

Goals:

- Spatially identify regional health trends
- Identify spatially differentiated approaches to community based interventions in an effort to reduce unnecessary emergency room visits and readmissions
- Support health system and public health decision makers by integrating spatially-enabled community health information with clinical care information
Drivers:

- Healthcare Reform (e.g., Affordable Care Act) emphasizing health services and community health connections (e.g., ACOs, Readmission Reimbursement Changes)
- Rise of holistic-health concepts, linking environmental, lifestyle, and health services approaches
- Movement toward data-driven, evidence-based approaches to public health and health services
Conducting Health Geoinformatics

Advanced GIS Lab

The A-GIS Lab conducts Geographic Information Systems related research on Public & Environmental Health Issues, Transportation Safety & Humanitarian Disaster Response and Relief.
CISAT Academic Programs

Information Systems and Technology
Masters – 44 Units
Ph.D. – 76 Units

- MBA/MSIST
  84 Units
- IT Management MBA Concentration
- GIS Solutions Development
- Cyber Security
- Social Technologies
- Health Informatics

84 Units

Claremont Graduate University
Advanced GIS Lab

Lab Research Methodology
• Design Science research orientation

Lab Research Focus Areas
• Public and Health Services
• Environmental Health Issues
• Humanitarian Disaster Response and Relief
• Transportation Safety

Lab Innovative Solutions
• SafeRoadMaps and CrashHelp
• Community Health Management Systems
• Community Livability and Social Capital Tracking
The ESRI Development Center (EDC) confers special recognition to university departments with exemplary programs focused on educating students in the design and development of GIS applications using ESRI’s geospatial technologies.

The Center for Information Systems and Technology (CISAT) is home to an inaugural EDC. This unique resource for Claremont Graduate University provides students and faculty with the capabilities to teach and develop state-of-the-art applications in the Advanced GIS Lab, provides ESRI training focused on GIS and related technologies, and honors students through an annual achievement award.
Design Science is an outcome based information technology research methodology, which offers specific guidelines for evaluation and iteration within research projects.

Design science research requires the creation of an innovative, purposeful artifact for a special problem domain.
Lab Research and Development Methodology

The artifact must be evaluated in order to ensure its utility for the specified problem. In order to form a novel research contribution, the artifact must either solve a problem that has not yet been solved, or provide a more effective solution.

Both the construction and evaluation of the artifact must be done rigorously, and the results of the research must be accepted from both presented effectively both to technology-oriented and management-oriented audiences.
Sample Student Projects

- Spatial Applications in Health Services
- Spatial De-identification and EMS Response
- Personal Safety Algorithm and Application
- Tobacco Marketing and Teenage Smoking
Evolution of Healthcare

Fee-for-service model
  • Reimbursement for services rendered on the basis on quantity

Value Based Purchasing / Accountable Care
  • A shift toward quality - measured by patient outcomes and health

Rooted in government policy
  • Deficit Reduction Act of 2005 and Accountable Care Act
GIS as a Business Intelligence Tool

Gartner: 8 essential components of BI

- Reporting
- Dashboards
- Ad hoc query
- Search-based
  - OLAP
- Interactive visualization
- Scorecards
- Predictive modeling
- Data mining

GIS is similar in that it:

- Provides highly robust capabilities in most of these areas, and extends visualization and predictive modeling beyond traditional BI systems

- Allows for the leveraging of the spatial component of data, which is not a native component of traditional BI systems

- Maps and other visualization can help tell a story that is otherwise difficult to realize in traditional scorecards, charts, tables, etc.
GIS and Healthcare

Healthcare organizations possess a vast amount of data about their customers, the community, and their own operations.

Traditional healthcare IT systems largely underutilize or completely ignore the spatial component.

GIS has been used in healthcare settings, but not at the provider or insurer level to inform decision making.

The spatial component of healthcare data

<table>
<thead>
<tr>
<th>Patient home addresses</th>
<th>Patient work addresses</th>
<th>Healthcare facility locations</th>
<th>Information on local resources</th>
<th>Community health data</th>
<th>Demographic and environmental data</th>
</tr>
</thead>
</table>
Research Questions

How can spatially enabled data inform healthcare decision making at the community and clinical service delivery level?

What current healthcare business imperatives could benefit from a spatial perspective?

What are the range of organizational decisions that might be affected by introducing GIS-based IT artifacts?
Methodology

Action Design Research

Model specific business processes that have an impact on decision making

Extract, from those processes, datasets that have a spatial component

Use the identified processes and spatial data to build IT artifacts which showcase how geospatial technology can improve decision making
Economic Analysis
Community Analysis

Global Health Needs

Areas of Greatest Need

San Bernardino City  Riverside City

2013 COMMUNITY HEALTH NEEDS ASSESSMENT 102
Community Analysis

Community Service Needs
Insurer Compliance

- Application to show locations of providers
  - Primary Care Physicians
  - Specialists

- Ensure compliance with requirements
  - Physician to patient ratios
  - Access within geographic regions

- Will for proactive planning
  - Where providers are needed
  - Which at-risk patients have low access
Clinical Analysis

Table 3. Change in 30-day readmission rates following discharge for five causes of hospitalization, 2008 to 2010

<table>
<thead>
<tr>
<th>Condition</th>
<th>% Readmission</th>
<th>Relative change (%)</th>
<th>Absolute change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>16.2</td>
<td>15.9</td>
<td>-1.7</td>
</tr>
<tr>
<td>CHF</td>
<td>21.4</td>
<td>21.1</td>
<td>-1.4</td>
</tr>
<tr>
<td>AMI</td>
<td>18.7</td>
<td>18.1</td>
<td>-3.2</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>15.3</td>
<td>16.3</td>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>Surgical</td>
<td>12.7</td>
<td>12.4</td>
<td>-3.0</td>
</tr>
</tbody>
</table>

The Revolving Door: A Report on U.S. Hospital Readmissions

An Analysis of Medicare Data by the Commonwealth Fund
Studies from Patients and Health Care Providers by Peterson Index Research & Communication

February 2011

Claremont Graduate University
Local Resource Map

- Local resource identification
  - Doctor’s offices
  - Pharmacies
  - Shelter
  - Food
  - Transportation

- Key factor in reducing readmissions, and directing patients to appropriate resources at discharge
Provider Quality

- Ability to visualize providers in various ways
  - By type
  - By geographic area

- Symbolize or filter by quality metrics
  - Cost
  - Patient visit rates
  - Childhood immunization rates

- Better oversight and accountability
  - Between providers serving similar populations
  - Leads to long term health improvements
Patient

- Transportation Planning
- High value consideration for low income individuals without personal transportation

- A number of different applications
  - Assignment of PCPs
  - Access to local resources
  - Doctor visit compliance
GeoHealth Directions

**COMMUNITY**
Homeless Population Tracking
Asthma Risk Map

**INSURER**
Member Historical Utilization Tracking
Pharmacy Over-Utilization
Market Penetration and Outreach

**PROVIDER**
Geo-enabled Discharge Instructions
Route Optimization for At-Home Services

**INTERGRATION/PATIENT**
Community Resource Map
Community Health Intervention
For More Information

Brian.Hilton@cgu.edu
Center for Information Systems and Technology
Questions and Discussion