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Topics

- Health Geoinformatics Drivers
- The GeoHealth Applications Platform
- Conducting Health Geoinformatics Research
Example: Doctor Hotspot

http://video.pbs.org/video/2070853636/
Drivers:

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

Design a GeoHealth Applications Architecture and 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
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
• Health Exchange Tracking
Esri Partnership and Development Center (EDC)

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, and provides ESRI training focused on GIS and related technologies.
GeoHealth Applications Platform
Data from two main sources: Health Data (Community and Provider) and Geographic Data (Governmental and Organizational)

These data are merged into a common geo-database
Supporting Technologies: ArcGIS Server, BI platforms, Extract-Transform-Load tools, and GIS technology applications.

These technologies are used for the management of the Data Layer and the development of applications for the Spatial Analytics Layer.
GeoHealth Applications Platform

- Four Application Types:
  - Economic Apps
  - Community Apps
  - Clinical Apps
  - Integrative Apps
The Economic Apps analysis tool involves the use of analytical models and applications to determine hospital cost trends incurred by patients. This tool will help in raising patient awareness regarding patient cost trends and comparative costs across patient residential census tracts.
Economic Analysis

Total Medicare Reimbursements per Enrollee, by Adjustment Type
(Adjustment Type: Price, Age, Sex & Race; Year: 2010)
The Community Apps analysis tool will identify population trends at the census and community levels, determining for example, hot spots of disease prevalence, thereby identifying the need for public health intervention or prevention strategies.
Community Analysis

The map provided is from CDC Diabetes Data and Trends, which documents the public health burden of diabetes and its complications in the United States. For more information on this layer, go to http://apps.nccd.cdc.gov/DDTSTRS/default.aspx.
The Clinical Apps analysis tool will analyze hospital readmissions rates, ED utilization rates, and expected ER caseloads to support healthcare provider planning as analyzed by patient residential census tract.
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 2008</th>
<th>% Readmission 2010</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>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>CHF</td>
<td>21.4</td>
<td>21.1</td>
<td>-1.4</td>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>AMI</td>
<td>18.7</td>
<td>18.1</td>
<td>-3.2</td>
<td>&lt; 0.6</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>15.3</td>
<td>15.3</td>
<td>&lt; 0.5</td>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>Surgical</td>
<td>12.7</td>
<td>12.4</td>
<td>-3.0</td>
<td>&lt; 0.5</td>
</tr>
</tbody>
</table>

The Revolving Door: A Report on U.S. Hospital Readmissions
An Analysis of Medicare Data by the Dartmouth Atlas Project
Stories From Patients and Health Care Providers by PerryWeil Research & Communication

February 2013
Integrative Apps: Visual Analysis (classification and normalization, rates of incidence), Temporal Analysis (time-slider), Density Analysis (Initial identification of problem areas and locations),
Healthcare Cost Hotspots in Camden, NJ (Jan 2002-June 2008)

High Cost Buildings...
- Northgate II:
  - 3,901 visits, 615 patients
  - $83 million in charges ($21,000 per visit)
  - $12 million in receipts
  - 15% collection rate
- Abigail House:
  - 1,414 visits, 332 patients
  - $92 million in charges ($65,000 per visit)
  - $15 million in receipts
  - 16% collection rate

Overview of High Cost Hotspots...

Receipts: 37%
Visits: 27%
Patients: 18%
Area: 10%
Blocks: 6%

Camden Coalition of Healthcare Providers
CamConnect.org

Source: Cooper, Lounds, and Virtua Hospital and ER billing data
Jan 2002-June 2008
Integrative Analysis

Healthcare Cost Hotspots in Camden, NJ (Jan 2002-June 2008)

MaineCare Hotspot Analysis: Penobscot County
7/1/2008 - 6/30/2010

What is a hot spot?
A hot spot is any geography where a large number of high utilizers reside.
High Utilizers are defined as any individual with 3 or more hospital admissions or 6 or more ER visits within 2 years. Hot spots range from blue (no hot spot) to red (intense hot spot).

Source: Cooper, Loundes, and Virtua Hospital and ER billing data
Jan 2002-June 2008
GeoHealth Applications Platform captures, stores, analyzes, and displays data for use by a variety of stakeholders.

- Data, merged into a common geo-database, is displayed in a visual format to provide Situational Awareness and Decision Support with mechanisms for ongoing evaluation and feedback.
Integrative Analysis: GeoHealth Applications Platform
Research Projects in Health Geoinformatics
Sample A-GIS Lab Projects

• Use of Spatial Decisions in Health Services with a focus on Readmissions (Clinical)

• Spatial Analysis to Youth Exposure to Tobacco Sales and Advertising (Community)

• Spatial Analysis of Enrollment Patterns in Healthcare Exchange- Covered California (Economic)

• Executive Decisions Using Health DashBoards (Integrative)
Sample Research Projects Underway

Geospatial Business Intelligence Platform and Analysis for Health Services and Management

(Emergency Department Utilization Geospatial Analysis)
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Training in Health Geoinformatics
Master of Science in Information Systems and Technology with emphasis in Health Geoinformatics

Master of Public Health with emphasis in Health Informatics

PhD in Information Systems and Technology with MPH in Public Health

PhD in Health Promotion Sciences with MSIS in Information Systems and Technology

Interfield PhD in Information Systems and Technology and Public Health
The GeoHealth Applications Platform provides an architecture for economic, community, clinical, and integrated geospatial analyses in the health environment.

Research can encompass and interweave both knowledge building and applied problem-solving topics.

There are new skill sets needed to advance the Health GeoInformatics research and practice agenda.
For More Information

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Questions and Discussion