Developing Rational Service Areas (RSAs) for Healthcare Services Using Medicaid Claims Data in New York

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Center for Health Workforce Studies

- The Center for Health Workforce Studies (CHWS) — established in 1996—is an academic research center based at the School of Public Health at the University at Albany, State University of New York (SUNY)

- Mission: To provide timely, accurate information and conduct policy-relevant research about the health workforce

- Goal: To assist health, professional, and educational organizations, policy makers, planners, and other stakeholders to understand issues related to the supply, demand, distribution, and the use of health workers
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Developing Rational Service Areas
NY’s Approach on RSAs

• RSAs are geographic areas that represent how and where the population residing within that area “reasonably” seek certain health services

• RSAs should account for:
  o **Commuting Patterns**
    – Location of Patient/Provider
    – Patient flow
  o **Physical barriers**
    – Highways/Transportation
    – Mountains
    – Bodies of water
  o **Individual characteristics**
    – Demographics e.g. age, race, culture
    – Insurance status
### RSAs Development in NY

<table>
<thead>
<tr>
<th>RSAs Project</th>
<th># of RSAs</th>
<th>Data Source</th>
<th># of Claims</th>
<th>Provider Type</th>
<th>Needs Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Care</td>
<td>277</td>
<td>NY Medicaid Claims, 2013 Outpatient</td>
<td>6.3M</td>
<td>PC Physician</td>
<td>Rank each indicator &amp; combine</td>
</tr>
<tr>
<td>Dental Health</td>
<td>178</td>
<td>2015 General dentistry</td>
<td>1.9M</td>
<td>Dentist Inc. Ped.</td>
<td>Composite Indicator (CI) ranking</td>
</tr>
<tr>
<td>Mental Health</td>
<td>107</td>
<td>2017 MH services with ER</td>
<td>0.3M</td>
<td>Physician NP &amp; PA</td>
<td>Improved CI with Pop Density</td>
</tr>
</tbody>
</table>
Develop RSAs - NY Data

Platform: NYS Medicaid SIM Data Warehouse

- Record level claims for 4m+ patients
- Customizable view by patient/provider/claim type

<table>
<thead>
<tr>
<th>Pt. CIN</th>
<th>Age</th>
<th>Sex</th>
<th>Race</th>
<th>Home Zip</th>
<th>Provider NPI</th>
<th>Service Date</th>
<th>Procedure Code</th>
<th>Service Place</th>
<th>Service Zip</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>64</td>
<td>M</td>
<td>White</td>
<td>10001</td>
<td>10-digit</td>
<td>5/2/17</td>
<td>XXXX</td>
<td>Hospital</td>
<td>10002</td>
</tr>
</tbody>
</table>

Key for RSAs:

- Ability to link patient zip and provider zip
- Patient flow volume – # of claims
- Filters for provider/service type and place
Develop RSAs - Steps

1. Patient-Provider Matrices
2. Spatial/GIS Analysis
3. Social Network Analysis
4. RSAs Mapping
5. RSAs Revision
# 1. Patient-Provider Matrices

## Count-based Matrix
- Patient zip (row) by provider zip (column) – 1600x900
- Cell value – paired total claims

**Example of Matrices in NYC**

<table>
<thead>
<tr>
<th>Zip Code</th>
<th>10001</th>
<th>10002</th>
<th>10003</th>
<th>10004</th>
</tr>
</thead>
<tbody>
<tr>
<td>10001</td>
<td>160</td>
<td>55</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>10002</td>
<td>212</td>
<td>4194</td>
<td>1</td>
<td>106</td>
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<tr>
<td>10003</td>
<td>51</td>
<td>70</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>10004</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zip Code</th>
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<th>10003</th>
<th>10004</th>
</tr>
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<tbody>
<tr>
<td>10001</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10002</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
</tbody>
</table>

## Relational Matrix
- **Plurality** - highest percent of patients from one zip code obtained services in certain provider zip code(s)
- **1s** - plurality patient flow relationship
- **0s** – non-plurality
1. Patient-Provider Matrices

What to do with Enclosed Zip Codes
2. Spatial/GIS Analysis

Spatial Analysis with ArcGIS
- Boundaries created following roads/speed limits from providers
- “Cookie Cutter” was used to generate final relational matrix
3. Social Network Analysis (SNA)

**UCINET cluster analysis** (two-mode and n-cliques technique)
- Visualize matrix structure among zip codes (GTL method)
- 11 NYS regional networks created based on initial RSA subgroups
4. Mapping Initial RSAs

- **Zip codes** were grouped based on SNA
- **ArcGIS** mapping initial RSAs
- **Irrational Areas** identified

- Structure holes and enclosed RSAs
- Undetermined areas
- Areas excluded by 60-minute traveling rule
- Irrational area data revisited following the next highest plurality
5. Revising and finalizing RSAs

RSA Revision Rules:
- Contiguosness
- Non-overlapping
- Removing "cookie cutters"
- Reasonable locales
Findings

• Traveling patterns for NYS Medicaid patients do not follow geo-political boundaries, but follow actual supply of available providers and means of transportations

• RSAs in rural areas were larger and tended to be composed of more zip codes, compared to those in urban areas

• RSAs in upstate NY were also larger than in downstate NY, which indicated a longer travel distance for upstate Medicaid patients seeking healthcare services

• In New York City and other major metropolitan areas, RSAs were more localized and smaller than other regions, resulting from a larger number of providers and greater accessibility to public transportation
Using RSAs
For Needs Assessment
Next Step: RSA Needs Assessment

- Understand service utilization
- Identify RSAs with highest need
- Serve HPSA designations
- Inform policy makers/stakeholders about focus areas

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<th># of Indicators</th>
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<td>Rank each indicator &amp; combine quartile score</td>
<td>5 Health Indicators + 5 Demographic</td>
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<tr>
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<td>178</td>
<td>Composite Indicator (CI) ranking with revisit</td>
<td>8 Health + 3 Demo + 1 Geographical</td>
</tr>
<tr>
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<td>Improved CI ranking</td>
<td>3 Health Indicators + 11 Demographic</td>
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CI Ranking Steps

1. Literature Review
2. Choosing Indicators
3. Data Preparation (RSA level)
4. Normalization & Aggregation
5. Ranking & Robust Analysis
Example: Dental RSA Indicators

Geographic Indicator
• Population density – Pop. / mi²

Demographic Indicators
• Percent of racial/ethnic minorities
• Percent of people not speaking English at home
• Percent of people enrolled in Medicaid

Dental Health Indicators
• Medicaid dental ED visits rate
• Medicaid dental visits rate to primary care services
• Dental providers per 10,000 Medicaid enrollees
• Dental provider Medicaid acceptance rate
• Percent of low birth weight
• Percent of pre-term birth
• Mental providers per 10,000 Medicaid enrollees
• Medicaid mental ED visits rate
Questions?

- For more information, please email me at: rmartiniano@albany.edu or at (518) 474-2744.

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