Data Integration with Kaiser Permanente of Colorado

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*Developing Infrastructure for Patient-Centered Outcomes Research at Denver Health*

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*Agency for Healthcare Research and Quality - Webinar*

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Agenda

• Context
• Registries as Public Health Surveillance
  – BMI monitoring (and others)
  – Learning through PH surveillance to anticipate human subjects issues related to research
• Linkage with built and social environment data
• Progress to date
• Next steps and sustainability plans
SPAN 3-year AHRQ funded project
Scalable PArtnering Network for Comparative Effectiveness Research

- Federated query 2 domains: obesity and ADHD
- Knowledge gained in governance and technology
- Governance
  - Elliot T et al. Data warehouse governance programs in healthcare settings: A literature review and a call to action. eGEMS 1:1/15 http://repository.academyhealth.org/egems/vol1/iss1/15
- Technical
  - Data sharing infrastructure: data model, data quality assessment, and federated query tool
Key Data Integration Features (Colorado)

- Transparent, distributed data network
  - Modeled on the Mini-Sentinel (FDA) project and local experience with HMO Research Network (AHRQ) project

- Governance
  - Voluntary participation; unlike mandated reporting, data use agreements established/required

- Privacy
  - Minimal data necessary to achieve stated goal (de-identified to start)

- Technical
  - Infrastructure: 1) common data model, 2) emphasize data quality assessment, and 3) federated query tool
Rationale for Building a Data Integration Tool (Colorado)

• Colorado Health Observation Regional Data Service (CHORDS)
  – Provide a "laboratory" to develop and evaluate scientific methods to support public health surveillance (and research)
  – Afford Denver Metro and Colorado communities an opportunity to use existing EHR data systems for public health surveillance (and research)
  – Learn about barriers and challenges, both internal and external, to building a viable and accurate system of surveillance for public health events (e.g., conditions, behaviors and outcomes)
  – Build an event agnostic infrastructure for public health surveillance, quality assessment, and research
Colorado Health Observation Regional Data Service

Map showing connections between various health organizations across Colorado, including National Jewish Health, Children's Hospital Colorado, Kaiser Permanente, Denver Health, Metro Community Provider Network, University of Colorado Cancer Center, and others. The map is centered on the state of Colorado with other regions labeled for reference.
**CHORDS Registries**

Colorado Health Observation Regional Data Service

- e.g., Kaiser Permanente

**Standard (Virtual) Data Warehouse**

Secure federated query

**Secure federated query**

**CHORDS Query Service (PopMedNet)**

- Authorize
- Authenticate

Current registry efforts:
- BMI (children)
- CVD risk
- Tobacco use and SHS exposure
- Mental health
- Colorectal cancer
- Adult obesity
## Capacity to Support Multiple Conditions

<table>
<thead>
<tr>
<th>Project</th>
<th>Source</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado Clinical Translational Science Institute focused on regional informatics infrastructure for research; Cancer Center expertise</td>
<td>NIH</td>
<td>2008-2018</td>
</tr>
<tr>
<td>SPAN grant allowed initiation of virtual data warehouse (VDW) at DH, development of local expertise</td>
<td>AHRQ</td>
<td>2010-2012</td>
</tr>
<tr>
<td>Evaluation resulted in selection of Mini-sentinel PopMedNet model used FDA post-marketing surveillance</td>
<td></td>
<td>2012-2013</td>
</tr>
<tr>
<td><strong>BMI monitoring</strong> including environmental and socioeconomic data</td>
<td>TCHF</td>
<td>2011-2013</td>
</tr>
<tr>
<td><strong>Cardiovascular risk reduction</strong> - Community Transformation Grant</td>
<td>CDC</td>
<td>2011-2016</td>
</tr>
<tr>
<td>Tobacco use, second hand smoke exposure and cessation</td>
<td>CDPHE</td>
<td>2012-2015</td>
</tr>
<tr>
<td>Mental health and substance use</td>
<td>AHRQ</td>
<td>2013-2017</td>
</tr>
<tr>
<td>Obesity and colorectal cancer</td>
<td>PCORI</td>
<td>2014-2015</td>
</tr>
</tbody>
</table>
Evolution: Colorado Health Observation Regional Data Service (CHORDS)

- A local distributed health data network
- For both public health surveillance and research uses
- Based on long-standing partnerships (CHCO, DH, KPCO, UCD)
- Process fostered and driven by a number of cross-institutional studies and surveillance projects
- Developing rich local experience for distributed health data and a federated query network
BMI Monitoring Project

Current state of public health weight status surveillance:

• BRFSS self-reported demographic, weight data
• ~12,000 surveys/year/state = 700/year/Denver
• Allows county-level estimates only

BMI project:

• Combine measured BMI data from multiple institutions
• Include demographic data, location of residence
• Link BMI data, aggregated to meaningful geographic area (e.g. census tract), with built and social environment data
• Pilot a number of features of local data sharing network
Aggregated data provide larger total number, broader representation, and allow focus on vulnerable subpopulations.

Geocoded (patient address) maps of risk factors or health conditions can identify “hot spots” of higher prevalence.

Linkage with other “big data” sources can identify associated/contributory socioeconomic and/or environmental factors.

Permit targeted “place-based” interventions (e.g., social marketing, community resource development, and policy initiatives).
<table>
<thead>
<tr>
<th>Data</th>
<th>Source</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grocery stores</td>
<td>Reference USA</td>
<td>Points, aggregated into census tracts</td>
</tr>
<tr>
<td>Restaurants</td>
<td>Reference USA</td>
<td>Points, aggregated into census tracts</td>
</tr>
<tr>
<td>Food Deserts (USDA definition)</td>
<td>USDA Economic Research Council</td>
<td>At census tract level</td>
</tr>
<tr>
<td>Walkability (based on number of street intersections per unit area)</td>
<td>Streetmap USA/ ESRI web distribution</td>
<td>Points, aggregated into census tracts</td>
</tr>
<tr>
<td>Green space/parks</td>
<td>From wide variety of sources</td>
<td>Polygons (areas), with points of park entrance</td>
</tr>
<tr>
<td>Poverty</td>
<td>American Community Survey</td>
<td>Polygons (areas), aggregated into census tracts</td>
</tr>
<tr>
<td>(education, crime, ...)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Valid BMI in Denver County:
- all ages: 184,644 (31% of Denver population)
- adults: 119,075 (26%)
- children: 64,606 (51%)

Census tract coverage varies widely:
- higher than 50% for some targeted communities
- few with aberrant results
## RESULTS (Site-by-site comparisons)

### Body Mass Index (BMI)

<table>
<thead>
<tr>
<th>Total Sample Size by Site</th>
<th>KPCO</th>
<th>DHHA</th>
<th>CHCO</th>
<th>HPCHC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt; 18</td>
<td>80,813</td>
<td>54,836</td>
<td>207,770</td>
<td>2,337</td>
<td>345,756</td>
</tr>
<tr>
<td>Adults 18+</td>
<td>275,473</td>
<td>66,312</td>
<td>16,273</td>
<td>6,831</td>
<td>364,889</td>
</tr>
<tr>
<td>Total</td>
<td>356,286</td>
<td>121,148</td>
<td>224,043</td>
<td>9,168</td>
<td>710,645</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Median BMI, Adults 18+</th>
<th>KPCO</th>
<th>DHHA</th>
<th>CHCO</th>
<th>HPCHC</th>
<th>4 Site Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>26.4</td>
<td>26.9</td>
<td>23.7</td>
<td>27.3</td>
<td>26.5</td>
</tr>
<tr>
<td>2010</td>
<td>26.5</td>
<td>26.9</td>
<td>23.8</td>
<td>27.5</td>
<td>26.5</td>
</tr>
<tr>
<td>2011</td>
<td>27.0</td>
<td>28.0</td>
<td>23.9</td>
<td>28.4</td>
<td>27.1</td>
</tr>
</tbody>
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<table>
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<th>Median BMI %, Children &lt; 18</th>
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<th>4 Site Median</th>
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</thead>
<tbody>
<tr>
<td>2009</td>
<td>59</td>
<td>70</td>
<td>62</td>
<td>70</td>
<td>63</td>
</tr>
<tr>
<td>2010</td>
<td>60</td>
<td>72</td>
<td>64</td>
<td>75</td>
<td>64</td>
</tr>
<tr>
<td>2011</td>
<td>58</td>
<td>72</td>
<td>68</td>
<td>74</td>
<td>65</td>
</tr>
</tbody>
</table>
Seven County Region: Percent Coverage of Population
(Valid BMI / Census Population)
Proportion of Children with a Valid BMI, Denver
Proportion of Adults with a Valid BMI, Denver
Proportion of Children with Obesity, Denver

Percent Obese, Children
- 0.00 - 6.52
- 6.53 - 12.00
- 12.01 - 16.44
- 16.45 - 20.38
- 20.39 - 26.67
Activity Plan for Melissa McClung

- Briskly walk around the 2 mile loop 1 time to burn 180 calories. Walk the loop 3 times per week.
- Take a Zumba class at Harvard Gulch Recreation Center (720-865-0905) on Saturdays from 9:00-10:00 AM.

January 7, 2014
What next for KP and DH?

- Build out VDW (i.e., new version, add tables, required content/variables, extend time range: 2011-2013)
- Conduct comprehensive data quality assessment
- Build mental health (depression) based reports for Denver
- Explore differences in member-based vs. visit-based definition of denominator population
- PCORI funded obesity and colorectal cancer (PORTAL) registries and PCORnet CDRN “common” registry incorporating patient reported outcomes
What next?

- Expand range of stakeholders, governance, and use cases
  - **Public health entities** (surveillance, community interventions)
  - **Researchers** (clinical interventions, care delivery interventions, community interventions, studies of social and environmental influences on health)
  - **Delivery systems** (integrated environmental information into decisions) – point of care reports

- Potential new domains: asthma, hepatitis C, alcohol/substance dependency, injuries
Sustainability strategy

- Engage a broad coalition of stakeholders – healthcare providers, hospitals, health departments, ACO, HIE, ...
- Create “condition agnostic” distributed surveillance and research network
- Facilitate incorporation of new social/environmental data (barriers and assets)
- Standardize approach to geocoding, data reporting to a range of stakeholders
- Target outreach and community-based interventions to those who need them, not only those who seek them
- Develop cadre of applied researchers and methods
Discussion/Questions?