Integrating ACS Data with Electronic Health Records: Using Community Vital Signs to Investigate Health-Related Outcomes

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OVERVIEW

• What is OCHIN?
• OCHIN Research
• ADVANCE and ACS Data
• BACKGROUND as Example
WHAT IS OCHIN?

OCHIN is a **nonprofit health care innovation center** designed to provide knowledge solutions that promote quality, affordable health care to all.

**Technology**
- Best-of-breed technologies targeted to the needs of the safety net and health care transformation

**Research**
- Research focused on improving the health of underserved populations, enhancing quality of care and informing health policy

**Services**
- Professional services that range from clinic operational support to strategic planning

- **Data Analytics**
  - Electronic Health Records
  - Networking & Broadband
  - Telehealth

- **Health Systems**
  - Practice Transformation
  - Health Policy
  - Social Determinants of Health

- **Billing**
  - Compliance & Security
  - Consulting
  - Staff Augmentation
OUR MEMBERS

**Federally Qualified Health Centers**
- Public or private nonprofit, charitable, tax-exempt organizations that receive funding under the Public Health Services Act and provide comprehensive and preventive care to persons of all ages regardless of their ability to pay or health insurance status

**Private Clinics**
- Clinics controlled by a practitioner and operated for profit, which provide primary care or specialty services

**Academic Health Centers**
- Institutions that consist of a medical school, at least one other health professions school or program, and at least one affiliated or owned teaching hospital

**Rural Health Clinics**
- Public, private, or nonprofit clinics located in a rural, medically under-served area that provide primary care services

**Local Health Department Clinics**
- Clinics supported by public funds to provide primary care and preventive health services
<table>
<thead>
<tr>
<th>Service</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY CARE</td>
<td>MENTAL HEALTH</td>
</tr>
<tr>
<td>DENTAL</td>
<td>PUBLIC HEALTH</td>
</tr>
<tr>
<td>IN-PATIENT</td>
<td>24 HOUR EMERGENCY</td>
</tr>
<tr>
<td>EARLY CHILDHOOD</td>
<td>SCHOOL-BASED HEALTH</td>
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<tr>
<td>ANCILLARY SERVICES</td>
<td>CASE MANAGEMENT</td>
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<tr>
<td>SOCIAL WORK</td>
<td>VISION</td>
</tr>
<tr>
<td>NATUROPATHIC MEDICINE</td>
<td>HIV MEDICAL CARE</td>
</tr>
<tr>
<td>HEALTHCARE FOR HOMELESS</td>
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</table>
OCHIN is committed to building the nation’s leading primary care focused network for health services, outcomes, and policy research with vulnerable and underserved communities.

Our aim is to equitably improve health, enhance care, and inform policy through research.
OUR NETWORK

3,641,037 Patients

97 Health Systems

15 States

519 Clinic Sites

56.2% FEMALE PATIENTS

26.5% PATIENTS UNDER 18

22.9% UNINSURED PATIENTS

Patient Distribution by Clinic’s State
OCHIN RESEARCH PRIORITY AREAS

*OCHIN clinical quality metrics and organizational priority areas
We are one of a just few organizations currently capturing aggregate health care data and statistics on low income and uninsured populations.

We have one of the nation’s most diverse patient databases of Medicaid-insured and uninsured individuals.

Our centralized expertise and collaborative of innovative organizations enables us to develop and test information technology tools.
ADVANCE
EHR DATA FOR RESEARCH USE

OCHIN Epic EHR

Health Choice Network (HCN) Intergy EHR

Fenway Health Centricity EHR

Research Data Warehouse

ADVANCE Clinical Research Network

Health Landscape

PCORnet/PCRF
The OCHIN-led ADVANCE Clinical Data Research Network is the most comprehensive database on healthcare and outcomes of safety net patients in the U.S.

- **Female Patients**: 55.8%
- **Patients Under 19**: 26.9%
- **Spanish Speaking**: 19.6%

**Patient Distribution by Clinic’s State**

- **Patients**: 4,530,563
- **Health Systems**: 134
- **States**: 24
- **Clinic Sites**: 1,116
COMMUNITY VITAL SIGNS (CVS)

• Relatively New for Clinical Data
  – Context matters
  – Using neighborhood-level variables
  – Linking to patient addresses

• Robert Graham Center + Health Landscape
  – Partnership through ADVANCE
  – Geocoding and aggregated data (including ACS) that is integrated w/ Research Data Warehouse
GEOCODING AND CVS DATABASE

• Initial load included all current and historic addresses for OCHIN patients (> 2 million addresses)

• Over 130 CVS variables integrated

• Currently performing quarterly updates

• Moving toward close-to-real-time model (i.e., update geospatial data at moment of address update)
CONCEPTUAL MODEL OF SDH IN PRIMARY CARE

Step 1: Collect & Organize SDH Data

Step 2: Present & Integrate SDH Data into Primary Care Workflows

Step 3: SDH Data Triggers Automated Support & Action

The ADVANCE Research Data Warehouse Includes:

- **Demographics**
  Patient information, such as date of birth, sex, race, Hispanic ethnicity, etc.

- **Procedures**
  Procedure code(s) associated with each encounter.

- **Death Date and Cause**
  Death date and associated cause of death diagnosis.

- **Dispensing**
  Medication dispensing records for publicly and privately insured patients. Dispense date, NDC, amount, etc.

- **Encounter**
  Encounter type, date, provider, location, discharge disposition, etc.

- **Prescribing**
  Rx order information such as order date, start date, end date, RxNorm CUI, refills, quantity, etc.

- **Diagnosis**
  Diagnosis code(s) associated with each encounter.

- **Vital Signs and Smoking Info**
  Measure date, weight, height, blood pressure, smoking/tobacco status, etc.

- **Condition**
  Problems list and medical history diagnoses. Report date, onset date, resolved date, etc.

- **Lab Results**
  Result date, result value, units, normal range, LOINC, etc.

- **Community Vital Signs**
  Community indicators at the census track, ZCTA and/or county levels such as census indicators. These indicators have been linked to current and historical patient addresses.

- **Patient Reported Outcomes**
  Screening tool scores such as PHQ, DAST, SBIRT, AUDIT, etc.
AMERICAN COMMUNITY SURVEY DATA

• Consistent source of data for US neighborhoods
  – Census tract address linked for 85-90% of patients
  – ZCTA and county linkages as well
  – Socioeconomic and demographic data

• Social Deprivation Index* - RGC
  – Composite measure of area-level deprivation based on seven demographic characteristics
  – One “powerful” indicator of social and geographic context

BACKGROUND PROJECT

• Bettering Asthma Care in Kids - Geographic Social Determinants Data to Understand Disparities
  – OCHIN + OHSU Family Medicine
  – Funded by Natn’l Institute on Minority Health + Health Disparities
  – September 2017 – June 2022

• Primary Aims
  – Compare care utilization + quality in asthmatic Latino children with that of non-Hispanic white children in nationwide network of CHCs
  – Compare how individual-level and community-level social determinants of health affect receipt of ambulatory asthma care quality measures
Assessing address history

- Data are often messy due to entry errors, etc.
- Info updated at patient visits
- “Dates” of residence are actually visit dates – best proxy for timeline
- Below example of address history for a patient:

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<thead>
<tr>
<th>start_date</th>
<th>end_date</th>
<th>tract_id</th>
<th>zcta</th>
<th>stcofips</th>
<th>addr_type</th>
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<tr>
<td>2012-08-14</td>
<td>2015-02-20</td>
<td>13267</td>
<td>55104</td>
<td>27123</td>
<td>Street Address</td>
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<tr>
<td>2015-02-20</td>
<td>2017-04-06</td>
<td>12958</td>
<td>55407</td>
<td>27053</td>
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<td>2017-06-06</td>
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<td>13179</td>
<td>55407</td>
<td>27053</td>
<td>Postal</td>
</tr>
</tbody>
</table>
• Some Initial Decisions
  – Using longest duration of residence at an address
    • Only certain address types
    • Smallest possible geo-unit
  – Considering # of address changes
  – For patients with consistent address and geo-location (61%), assign community-level variable with:
    • Average of 2007-2011 and 2012-2016 American Community Survey (ACS) periods
    • Difference between the periods and its direction (i.e. positive, negative, null change)
The Role of Social Deprivation on Asthma Outcomes

Objective: To determine if higher neighborhood deprivation is associated with higher odds of asthma diagnosis and care measures among children treated at community health centers.

Population studied: A sample of 299,265 children aged 3-17 who had ≥1 ambulatory visit in study clinics between 2008-2017 and who had census tract-level geocoded addresses.

Outcome measures: Binary indicators of 1) asthma diagnosis, 2) asthma severity diagnosis, 3) albuterol prescription, 4) inhaled steroid prescription, and 5) oral steroid prescription. We used GEE logistic models adjusted for patient-level characteristics including age, sex, ethnicity, number of visits, insurance, BMI, and clinic site.

Results: The adjusted odds of having an asthma diagnosis were 30% higher for those living in areas with the most deprivation (top quartile), compared to the least deprived areas (lowest quartile). Patients in deprived neighborhoods also had 36% higher odds of having asthma severity diagnosed, 18% higher odds of albuterol prescription, and 22% higher odds of inhaled steroid prescription. The odds of oral steroid prescription were 6% lower for patients from the most deprived neighborhoods compared to those from the least deprived.

Conclusions: Among community health center patients, residing in a more socially-deprived neighborhood was associated with greater odds of having asthma diagnoses and medications documented. Regular access to administrative deprivation data such as the SDI may permit primary care providers and health systems to deliver higher quality care in a community context.
CONCLUSIONS

- Integrating ACS and Neighborhood Data
  - Newer development for primary care + social determinants
    - Place matters
    - What’s next?
  - Presents challenges and questions
    - Aligning dates of residence and ACS estimates
    - Overall issue of “spatial uncertainty”

- More Projects Ahead
  - Insurance status and preventive screenings
  - Reproductive care
  - Many more ideas in the pipeline!
For research overviews, study summaries, results, routine updates, blog posts, and contacts visit us online at:

www.ochin.org/ochin-research
www.advancecollaborative.org
Thank You!

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