Population Health Situational Awareness: Getting the Data You Need to Build Equity in Child Asthma Outcomes

Part 2 of 3 in a Webinar Series on Solutions for the Indoor Environmental Determinants of Health (IEDOH)

Hosted by
U.S. Environmental Protection Agency (EPA)

December 13, 2022, 1:00—2:30 p.m. EST
**Agenda**

Welcome to a Series on Solutions for the Indoor Environmental Determinants of Health (IEDOH) in Asthma and Community Health.................................1:00 p.m. EST

Part 2: *Population Health Situational Awareness: Getting the Data You Need to Build Equity in Child Asthma Outcomes*

Discussion Among Panel of Questions from Audience.................................30 minutes

Closing: Requests and Offers to Build National Asthma Impact.......................3:30 p.m. EST
Who Is Here Today?
Polling Question 1

Do you know much about using data and analytics to reveal where indoor environmental factors may be contributing to community asthma burden?

1. Yes, I know about population data and analytics to focus on community-level environmental asthma burden.
2. No, I am not familiar (yet) with terms like population-level data and analytics in asthma care.
3. I know a little and want to learn more.
4. I do not want to use data and analytics in my indoor environments and asthma work.
Welcome to Solutions for the Indoor Environmental Determinants of Health

- EPA is a federal lead for environmental risk reduction in health care standards.
- EPA’s Indoor Environments Division (IED) studies, supports and spotlights technical solutions for the indoor environmental determinants of health, the IEDOH, particularly in asthma.
- For 15+ years, with 4,500+ champions, IED has developed proven solutions communities can use to address the IEDOH in asthma.
Welcome to Solutions for the Indoor Environmental Determinants of Health

• High-quality asthma systems break down siloes to address the IEDOH in asthma.

• Systems require time, partnership, data and investment to scale and sustain.

• Assembling community systems to address the IEDOH in asthma is a model for the social determinants of health (SDOH).
Solutions for the Indoor Environmental Determinants of Health

• **IEDOH solutions for asthma reflect SDOH models** for clinic–community integration, housing-related supports, and health equity priorities in health care.

• **This webinar series spotlights solutions with health care for the IEDOH** to help health care innovation stakeholders advance health equity with in-home environmental asthma care.
Join the Asthma Community Network to access Solutions for the IEDOH at AsthmaCommunityNetwork.org
Solutions for the IEDOH in Asthma and Community Health
Population Health Situational Awareness:
Getting the Data You Need to Build Equity in Child Asthma Outcomes

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Population Health Situational Awareness: Getting the Data You Need to Achieve Equity in Child Asthma Outcomes

Andrew F. Beck, MD MPH
Solutions for addressing indoor environmental determinants of health

December 13, 2022

Andrew.Beck1@cchmc.org or @afbeckMD
Objectives

• Consider how and why certain patients and populations are disproportionately burdened by asthma morbidity
• Employ situational awareness to inform collective action
• Discuss intervention strategies aimed at improving asthma outcomes for children and communities (across a city)
A child I met during my training
What is population health?

“The health outcomes of a group of individuals, including the distribution of such outcomes within the group.”


Population health research is “the study of the conditions that shape distributions of health within and across populations, and of the mechanisms through which these conditions manifest as the health of individuals.”

Keyes & Galea (2016)
Pursuing population health – key questions

Why are certain children more likely to face preventable morbidity (and mortality)?

Why are certain communities more likely to face preventable morbidity (and mortality)?

How can we use shared situational awareness to move, with urgency, toward action?
Situational awareness is “the perception of environmental elements and events with respect to time or space, the comprehension of their meaning, and the projection of their future status.” It is a tool for population health action, for asking / answering critical questions.

✓ **Perception** identifies key data and contextual elements.
✓ **Comprehension** employs analytics to consider meaning, significance of data / context.
✓ **Projection** thinks ahead, forecasting what might be coming.
Why are certain children more likely to face preventable morbidity (and mortality)?
Factors that “determine” health outcomes

1. Medical care is insufficient for ensuring better health outcomes
2. Social conditions, policies, programs associated with health outcomes
3. New payment models prompting interest in addressing socioeconomic, environmental factors
4. Frameworks for integrating social and medical care emerging
5. Prompting experimentation at multiple levels

Source: https://nam.edu/social-determinants-of-health-101-for-health-care-five-plus-five/
Social determinants of health (SDH)

“Conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development agendas, social norms, social policies and political systems.”

http://www.who.int/social_determinants/en/
Health equity

“Everyone has a fair and just opportunity to be as healthy as possible. This requires removing obstacles to health such as poverty, discrimination, and their consequences, including powerlessness and lack of access to good jobs with fair pay, quality education and housing, safe environments, and health care.”

https://www.rwjf.org/en/library/research/2017/05/what-is-health-equity-.html
Inside the homes of too many of Cincinnati’s youth
Individual-level
Social Risk Factors & Social Needs
Social risk factors are specific individual-level adverse social conditions (i.e., adverse material and psychosocial circumstances) that are associated with poor health. Behavioral risk factors are not social risk factors. Social needs are the social risk factors that individuals (e.g., patients, clients, beneficiaries) identify and prioritize. Example: Food insecurity

Community-level
Social Determinants of Health
Underlying community-wide social, economic, and physical conditions in which people are born, grow, live, work, and age. These conditions shape the distribution, chronicity, and severity of individual social risk factors and social needs. Example: Food desert

Societal-level
Structural Determinants of Health Equity:
The societal norms, macroeconomic, social & health policies; and the structural mechanisms that shape social hierarchy and gradients (e.g., power, racism, sexism, class, and exclusion), and, in turn, the distribution, quality, and chronicity of social determinants of health and social needs. Example: Supermarket redlining, structural racism

Source: HealthBegins. Upstream Communications Toolkit

Housing stability (evictions)
Housing conditions
Legacy of redlining
Asking the right question – screening

• National Academy of Medicine (NAM) now recommends:
  • Standardized collection of race/ethnicity, tobacco, alcohol, residential address
  • Data on educational attainment, financial strain, stress, depression, physical activity, social isolation, intimate partner violence, neighborhood median household income
  • Integration of SDH data with electronic health record (EHR)
• American Academy of Pediatrics (AAP) encourages screening to “facilitate prevention services” and “improve the health of all children”

Adler & Stead (2015)
AAP Policy Statement (2016)
Perception – Social histories with empathy and purpose

<table>
<thead>
<tr>
<th>Domain/Area</th>
<th>Examples of Questions</th>
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<tbody>
<tr>
<td>Income</td>
<td>Do you ever have trouble making ends meet?</td>
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<td>Do you ever have a time when you don’t have enough food? Do you have WIC? Food stamps?</td>
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<td>Housing</td>
<td>Is your housing ever a problem for you?</td>
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<td>Do you ever have trouble paying your electric/heat/telephone bill?</td>
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<td>Education</td>
<td>How is your child doing in school? Is he/she getting the help to learn what he/she needs?</td>
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<td>Is your child in Head Start, preschool, or other early childhood enrichment?</td>
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<td>Legal status</td>
<td>Do you have questions about your immigration status? Do you need help accessing benefits or services for your family?</td>
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<tr>
<td></td>
<td>Do you need help accessing benefits or services for your family?</td>
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<td>Literacy</td>
<td>Do you read to your child every night?</td>
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<td>How happy are you with how you read?</td>
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<td>Have you ever taken out a restraining order?</td>
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<td>Do you feel safe in your relationship?</td>
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<td>Do you feel safe in your home? In your neighborhood?</td>
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WIC indicates Supplemental Nutrition Program for Women, Infants, and Children.

Kenyon (2007)
Beck (2012)
Chung (2016)
Perceiving inequitable systems

• 1 in 6 US children live in poverty
  • Children are poorest age group in the US
  • Federal poverty level for a family of 4 is $27,750 – half income needed for basic financial security
• Disproportionate % of poor children are children of color
• Child Tax Credit played a substantial (temporary?) role in lifting children out of poverty

https://www.census.gov/library/stories/2022/10/poverty-rate-varies-by-age-groups.html
Comprehension: racial inequities in hospitalizations across conditions

Beck (2018)
Number of fewer admissions per year if Black youth had the same admission rate as non-Black youth.
Projection: racial inequities in hospitalizations, measured over time

Asthma admissions per 100,000 population from SW Ohio, 12 month moving average

Patients identifying as only Black or African American and All other patients

6-fold difference in hospitalization rates by race

Admission defined as Inpatient or Observation stay based on encounter type. Based on primary diagnosis code of asthma or related condition with asthma as a secondary diagnosis, excluding patients also admitted for cystic fibrosis or anomalies of the respiratory system. Monthly admissions adjusted to 30 day month. County of residence defined as county of geocoded address. Southwestern Ohio includes the following counties: Adams, Brown, Butler, Clermont, Clinton, Hamilton, Highland, and Warren. Race determined by mapping of self-reported values in Epic.
Why are certain communities more likely to face preventable morbidity (and mortality)?
Redlining and disinvestment

Life expectancy – 69 years

Life expectancy – 84 years

https://dsl.richmond.edu/panorama/redlining/#loc=5/39.1/-94.58
Neighborhood all-cause inpatient bed-day rate per 1,000 children per year (FY2015-2019)
80-fold difference in asthma hospitalization rates across our neighborhoods
### Inequitable Drivers

- Access to safe, healthy physical environments (home, school, neighborhood, green space)
- Exposure to environmental triggers (smoke, mold, rodents etc.)

### Structural Factors

- Racial wealth gap
- Concentrated poverty
- Housing discrimination and insecurity
- Neighborhood violence
- Education inequities (variation in school district resources)

### Environmental Factors

- Residential segregation
- Environmental racism
- Poor housing quality

### Proximal Factors

- Institutional racism in healthcare systems
- Insurance status variation
- Weathering effects of racism (e.g., chronic stress)
- Inadequate data collection, analysis, monitoring and sharing

### Inequitable Outcome

- Increased prevalence of asthma
- Increased rates of poorly controlled asthma
- Increased rates of asthma related ED visits and admissions
- Increased rates of asthma related morbidity & mortality

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“Anti-Black **structural racism** drives health inequities... through a **cascade** of factors and has manifestations warranting dedicated analysis and response.”

Cross-sector health system – from city, to community, to household (and child)

Source: Cincinnati Area Geographic Information System, Freestore Foodbank, US Census American Community Survey
Social risks/needs

- Parents overwhelmed and stressed, “fog”
- Parents with limited social support
- School enrollment is challenging
- Older sibling performing poorly in school
- Children overdue for well care
- Transportation barriers (one car, unreliable bus)
- Family is living in poor housing with previous lead and mold exposure and an unresponsive landlord
- Hours are rigid
- Run out of food when SNAP benefits lapse before end of month

Opportunity to thrive

Social Determinants of Health

System of Assets

- Education (schools, early childhood)
- Job training and Employment Opportunities
- Mental health supports
- Preventive health care
- City Health and Building Departments
- Health insurance plans
- Food banks and pantries, WIC
- Safe places to play

A. Henize
How can we use shared situational awareness to move, with urgency, toward action?
Situational awareness & learning health systems

Organize
- Identify stakeholders and organize

Plan
- Align goals and develop plan

Execute
- Agree on performance metrics, evaluate progress

Improve
- Evaluate performance, adjust actions to reach goals

What are learning health systems (LHS)?
Core practices for pursuit of equity via LHS

1. **Establish principle.** Position equity as an essential focus.
2. **Measure for equity.** Track data that matter to drive and sustain success.
3. **Lead from lived experience.** Ensure people with lived experience are leading the work.
4. **Co-produce.** Design, create, learn, act, and sustain together.
5. **Redistribute power.** Reallocate power and leadership across the system.
6. **Practice a growth mindset.** Cultivate an environment and expectation for growth.
7. **Engage beyond the healthcare system.** Catalyze change across systems that produce health.
Building an Asthma LHS

• Work to collaboratively define population and set goals, measures, theory
• Facilitate organization, sharing of information and resources
• Situational awareness (data, dashboards) to build will, shared purpose
• Integrate research, practice, improvement
Hyp: Shared *situational awareness* and network organizing (making it easier to connect and work together) will get the right resources to the right person (and populations) at the right time.
Adding precision to population health

Getting the right resources to the right person (population) at the right time

• **Surveillance & Detection**: Measurement infrastructure for surveillance and detection (overall, distribution)
  - EHR, Medicaid, geospatial datasets

• **Predicting risk**: Transformative analytic capabilities to predict risk, characterize gaps, and inform action

• **Targeting interventions**: Co-design to achieve better, more equitable outcomes

Kuo (2019)
Perception, comprehension, and projection of potential asthma triggers (e.g., viral infections)
Perception, comprehension, and projection of potential asthma triggers (e.g., outdoor air quality)

E. Rasnick, Q. Duan, C. Brokamp
Perception, comprehension, and projection of potential asthma triggers (e.g., range of exposures)
ESTABLISHING a City of Cincinnati Children and Families Cabinet, whose purpose is to advise the Mayor and Council about policy initiatives and to measure and monitor data on the improvement of safety, housing, health, cultural and societal exposure, and career opportunities for children and families in Cincinnati.

WHEREAS, nearly forty-three percent of Cincinnati children live in poverty, and far too many of our families are suffering from the effects of poverty; and

WHEREAS, local governments have taken significant steps to better support children and families through strategic partnerships, investments, and leadership; and

WHEREAS, many City of Cincinnati government departments directly affect the lives of children and families, including the provision of safe drinking water from Greater Cincinnati Water Works, the assurance of safe housing from the Department of Buildings and Inspections, and enriching social interactions provided and encouraged through the Department of Recreation and Parks Department; and

WHEREAS, the City is fortunate to have knowledgeable and talented non-government partners who make huge impacts on the lives of children and families, from experts at medical institutions and social service organizations to philanthropic foundations; and

WHEREAS, the creation of a City of Cincinnati Children and Families Cabinet will assist the Mayor and City Council in their review of policies and programs that will make an empirical positive change in the lives of children and families; now, therefore,

BE IT ORDAINED by the Council of the City of Cincinnati, State of Ohio:

Section 1. That the Mayor and City Council hereby establish the City of Cincinnati Children and Families Cabinet ("Cabinet"), as further described herein, whose purpose is to advise the Mayor and Council about policy initiatives and to measure and monitor data on the improvement of safety, housing, health, cultural and societal exposure, and career opportunities for children and families. The Cabinet will also strive to improve communication between the City government and community stakeholders so that services to children and families are improved.
Where do children live?

Population under 18 by Census Block Group, approximately 66,000 kids

Source: Decennial Census Redistricting Data (PL 94-171). Under 18 population is the difference between total population and the population 18 and over.

S. Taylor, J. Michael, C. Brokamp
Grid over the city
An example of the grid: Avondale
Asthma admissions/ED visits by grid (by city blocks)

Admissions and emergency department visits for asthma at CCHMC facilities, 2017-2021

Source: CCHMC EHR, 2017-2021, address at time of discharge. Areas with at least 2 asthma visits. Shading is top-coded so that bright yellow represents top 2% of remaining grid squares.
Housing code violations by grid (city blocks)

Department of Buildings and Inspections code enforcements and Cincinnati Health Department health code violations related to triggers for asthma

Source: Cincinnati Health Department and Cincinnati Department of Buildings and Inspections, 2017-2021. Areas with at least 2 enforcements or violations shown. Shading is top coded, bright yellow represents top 2% of remaining grid squares.
Areas that are in the **top 5%** of building and health code violations and asthma encounters.
Moving to intervention

<table>
<thead>
<tr>
<th>Health service environment</th>
<th>Physical environment</th>
<th>Economic environment</th>
<th>Psychosocial environment</th>
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<tbody>
<tr>
<td>Distance to pharmacy</td>
<td>Housing code violations</td>
<td>Poverty rate</td>
<td>Crime rate</td>
</tr>
<tr>
<td>Live within &quot;pharmacy desert&quot;</td>
<td>Vacancy rate</td>
<td>Household income</td>
<td>Mental health access</td>
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<tr>
<td>Pharmacy quality metric</td>
<td>Rent rate</td>
<td>Home ownership</td>
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<tr>
<td>Distance to primary care</td>
<td>Home value</td>
<td>Car ownership</td>
<td></td>
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<tr>
<td>Live within undeserved area</td>
<td>Crowding/population density</td>
<td>Educational attainment</td>
<td></td>
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<tr>
<td>Vehicle availability</td>
<td>Exposure to pollution</td>
<td></td>
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<tr>
<td>Public transport availability</td>
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**GEOMARKERS**
- Low
- Low-medium
- Medium-high
- High
- Housing code violations
- ED revisits and rehospitalizations

**INTERVENTIONS**
- Medication delivery
- Care coordination
- Community health worker
- Home nurse visitation
- Medicaid rides
- Telemedicine
- Housing inspection
- Legal advocacy
- Air conditioning or filtration
- Development of affordable housing
- Financial services
- Medicaid rides
- Legal advocacy
- Public benefit procurement
- Community health worker
- Community agency referrals
- Community health worker
- Community agency referrals
- Resilience training
- Community partnerships

EHR referrals for community action

© 2022 Epic Systems Corporation.

Beck (2017)
Clinical-community partnership
E.g., Cincinnati Child Health Law Partnership (Child HeLP)

• Medical-legal partnerships address health-related social (and legal) needs
  • Housing, public benefits, education

• Patient- and household-level action
  • 10,000 referrals affecting 25,000 individuals
  • $1M public benefits recovered for families

• Population-level pattern recognition and action

Klein (2013)
Beck (2012)
Beck (2022)
Child HeLP and health outcomes

- Research to assess link between referral to medical-legal partnership and hospitalization
- Advanced biostatistical methods to “emulate” 100 randomized trials
  - Matched on age, date of referral (or concurrent visit), prior hospitalizations
  - Adjusted for remaining differences, including on census tract deprivation
- Hospitalization rate in year after referral 38% lower than if not referred

Beck (2022)
Systems thinking to support scale, spread

• Reorientation of **systems of care**, connections between stakeholders
  • Common measures, objectives, methods build shared purpose
  • Co-design interventions
  • Rapid, iterative prototypes adapted to situation, context
  • Evaluate overall (+ distribution of) health

• “Virtuous” cycle of investment and reinvestment to build both **capability** and **capacity**

• Outcome-focused **Culture of Equity**
Collectively choosing population health equity

"'Solidarity' would mean that individuals in the US legitimately and properly can depend on each other for helping to secure the basic circumstances of healthy lives." – Don Berwick

Rose (2001)
Berwick (2020)
Returning to that child I met during my training
Conclusions

• If neighborhoods can cause children to die, so too can they help children to thrive

• Pursuit of health equity requires us to identify, confront, and abolish the generational, systemic effects of racism

• Population health situational awareness allows us to perceive, comprehend, project and to **move upstream** more quickly

• **Every day must challenge us to think of one more thing we can do to advance better, more equitable outcomes for children**
Acknowledgements

- Cincinnati Children’s Department of Pediatrics
- Fisher Child Health Equity Center
- HealthVine (https://healthvine.cincinnatichildrens.org/)
- Health Equity Network
- All Children Thrive Learning Network (https://actcincy.org/)
- Cincinnati’s Children & Families Cabinet
- Cincinnati Health Department Environmental Health (https://www.cincinnati-oh.gov/health/)
- Legal Aid Society of Greater Cincinnati (https://lascinti.org/)
- People Working Cooperatively (http://www.pwchomerepairs.org/)
- Agency for Healthcare Research & Quality (RISEUP R01)
- Cincinnati Children’s Research Foundation (funding for Asthma Learning Health System)

And so many more!!
Thank you!

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Solutions for the IEDOH in Asthma and Community Health
Population Health Situational Awareness: Getting the Data You Need to Build Equity in Child Asthma Outcomes

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Polling Question 2

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1. Yes, I know about population data and analytics to focus on community-level environmental asthma burden.
2. No, I am not familiar (yet) with terms like population-level data and analytics in asthma care.
3. I know a little and want to learn more.
4. I do not want to use data and analytics in my indoor environments and asthma work.
Where Can I Learn More?

- Join the Asthma Community Network at www.asthmacommunitynetwork.org.
In Closing: Requests and Offers