

Child Opportunity Index (COI) and Asthma

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Child Opportunity Index (COI): History

- COI version 1.0 was initially created and described in November 2014 with the goal of establishing a validated measure of child opportunities across multiple metropolitan areas in the USA.
- Fundamentally, this initial version was designed to provide a “population-level surveillance system of child *neighborhood opportunity*” which they defined as “resources conducive to healthy child development”.
- In particular, it was designed to be a more expansive measure utilizing multidimensional features of opportunity rather than a singular measure of opportunity such as neighborhood poverty.
- This index covered 100 of the largest US metropolitan areas.

Acevedo-Garcia D., *et al.*, Health Aff (Millwood) 2014;33:1948–57.



Initial Index Construction

- Census tracts were used to define a “neighborhood”:
 - ~4,000 individuals within the neighborhood.
 - ~1,600 housing units were within each neighborhood.
 - Each of the metropolitan areas.
- Indices were selected for relevance to childhood development.
- Crime rates were NOT included due to variable reporting across metropolitan areas.

COI Version 1.0: Opportunity Indicators

• Educational Opportunities

- School poverty rate (eligibility for free or reduced-price lunch)
- Student math proficiency level
- Student reading proficiency level
- Proximity to licensed early childhood education centers
- Proximity to high-quality early childhood education centers
- Early childhood education participation
- High school graduation rate
- Adult educational attainment

• Health and Environmental Opportunities

- Proximity to health care facilities
- Retail healthy food environment index
- Proximity to toxic waste release sites
- Volume of nearby toxic waste release
- Proximity to parks and open spaces
- Housing vacancy rate

• Social and Economic Opportunities

- Foreclosure rate
- Poverty rate
- Unemployment rate
- Public assistance rate
- Proximity to employment

From: Acevedo-Garcia D., *et al.*, Health Aff (Millwood) 2014;33:1948–57.

Analyses from the Initial COI Reference

- In a metropolitan area, low opportunity areas were noted for:
 - 40% of black children.
 - 32% of Hispanic children.
 - 9% of white children.

Acevedo-Garcia D., *et al.*, Health Aff (Millwood) 2014;33:1948–57.

Milwaukee, Wisconsin, Metropolitan Area Child Opportunity Index, With Overlay Of Populations Of White, Black, & Hispanic Children

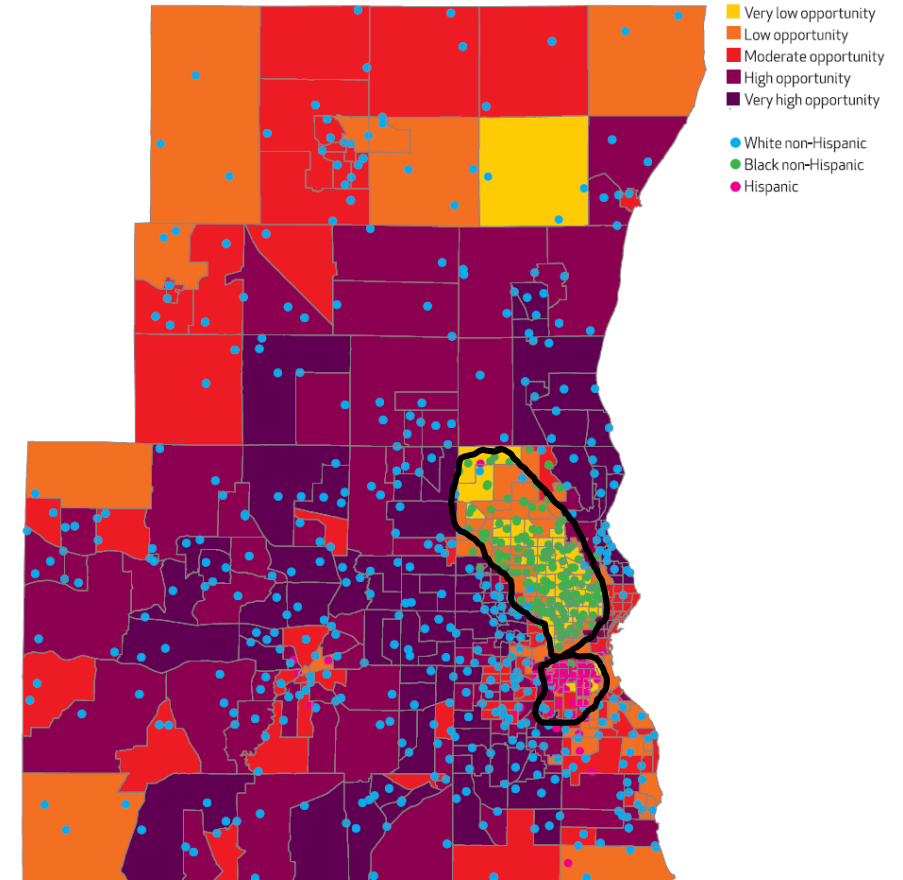
One dot represents 500 children. Dot placement is random within census tracts and does not identify the exact location of child populations.

White and black children are non-Hispanic.

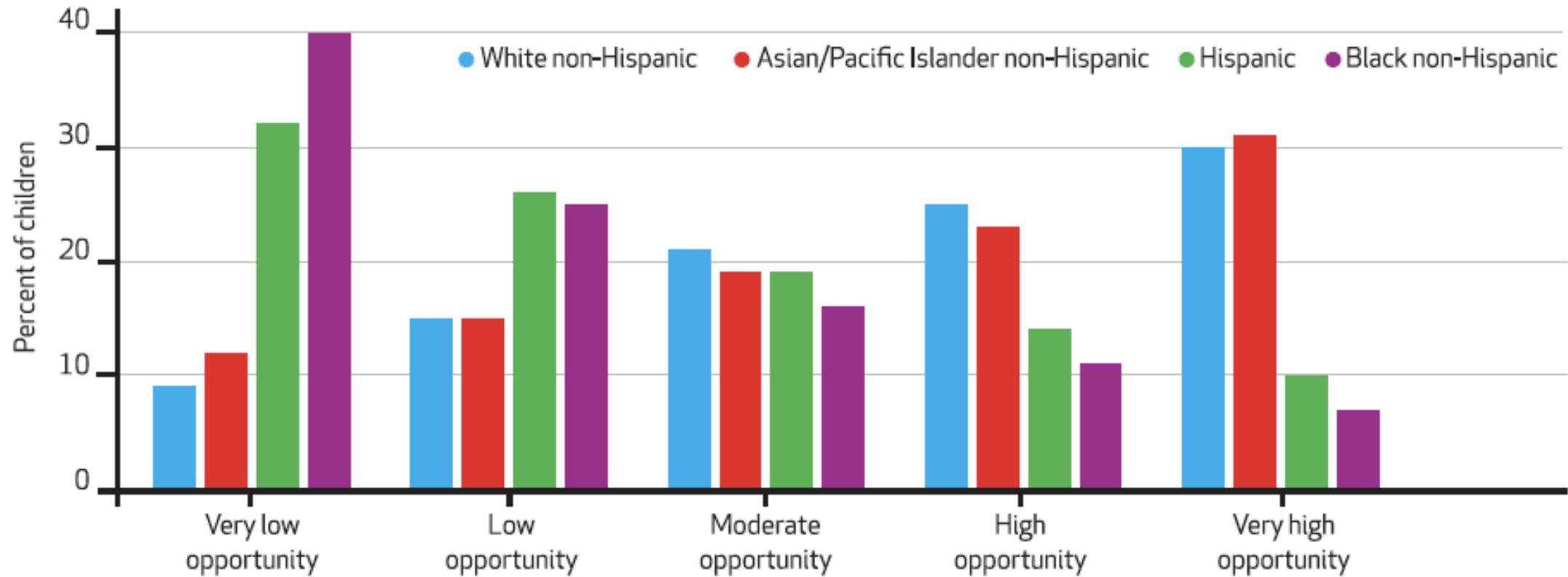
Hispanic children may be of any race.

The Child Opportunity Index is race neutral—that is, it includes no measures of racial/ethnic composition.

From: Acevedo-Garcia D., *et al.*, Health Aff (Millwood) 2014;33:1948–57.



Percentages Of Children, By Race/Ethnicity, Living in the Opportunity Quintiles Across all Metropolitan Areas Combined



From: Acevedo-Garcia D., *et al.*, Health Aff (Millwood) 2014;33:1948–57.

COI 1.0 and Disparities in Pediatric Asthma in Hamilton County

COI Category	Number of Census Tracts (n)	Percentage of Census Tracts (%)
Very Low	53	23.9
Low	39	17.6
Moderate	42	18.9
High	41	18.5
Very High	47	21.2
	Hospitalized Asthmatics (n)	Hospitalized Asthmatics (%)
Very Low or Low	1174	63.6
Moderate	307	16.6
High or Very High	364	19.7

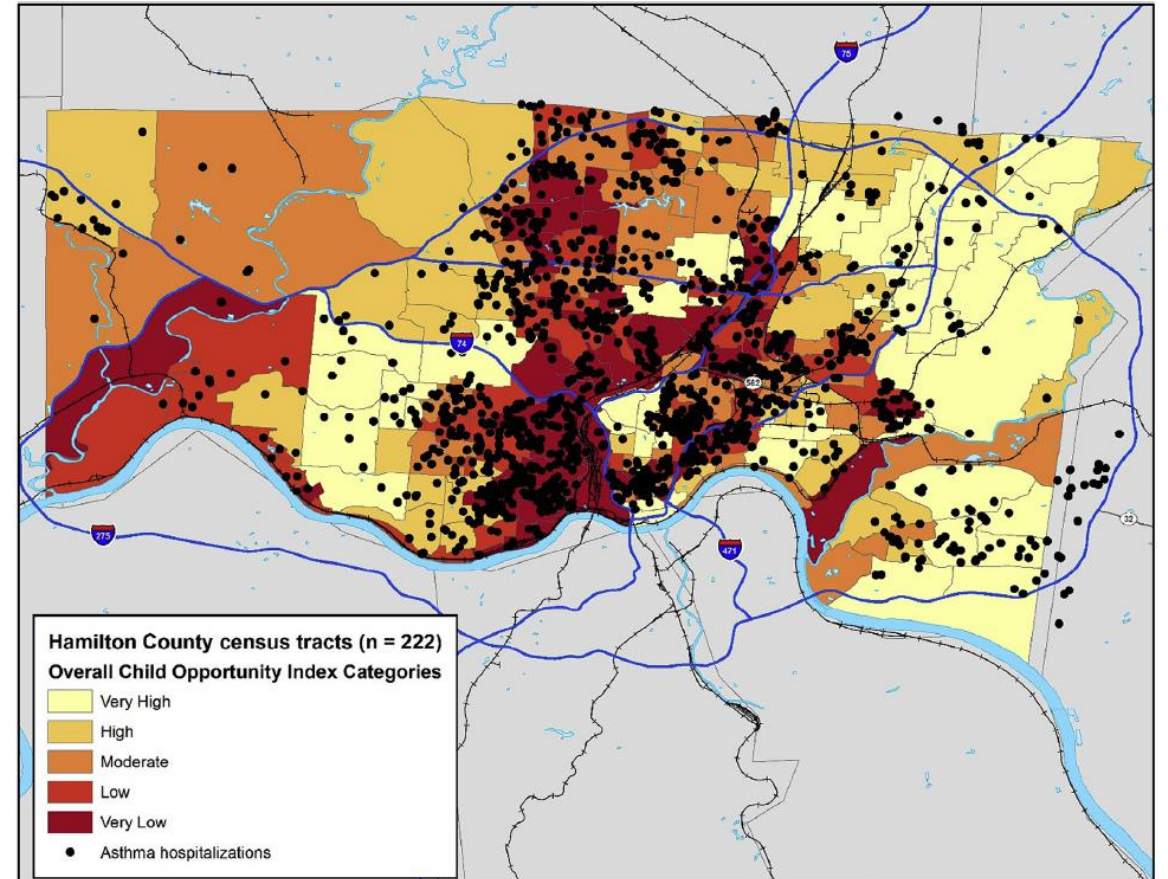
From: Beck A.F, *et al.*, J Pediatr 2017;190:200-206.



COI 1.0 and Disparities in Pediatric Asthma in Hamilton County

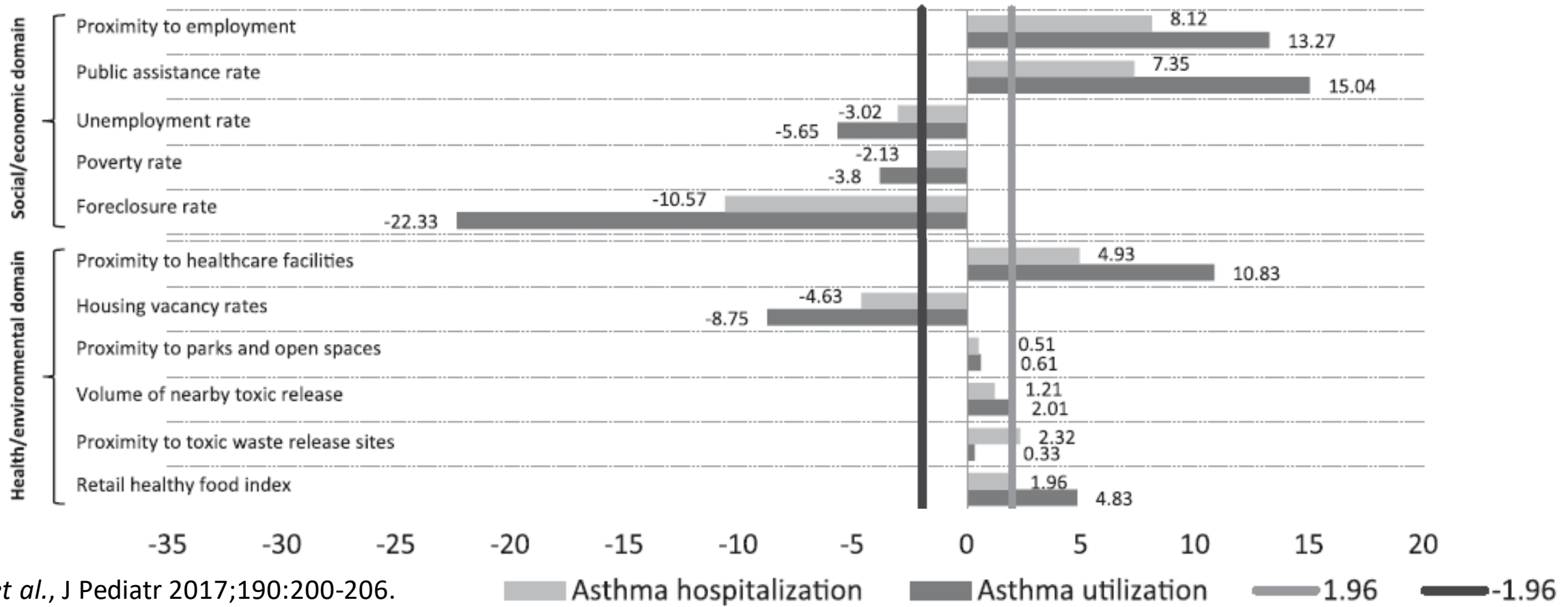
Geocoded distribution of asthma hospitalizations among Child Opportunity Index (COI) categories around Hamilton County.

Asthma hospitalizations are largely concentrated within low to very low COI categories.



Beck A.F, *et al.*, J Pediatr 2017;190:200-206.

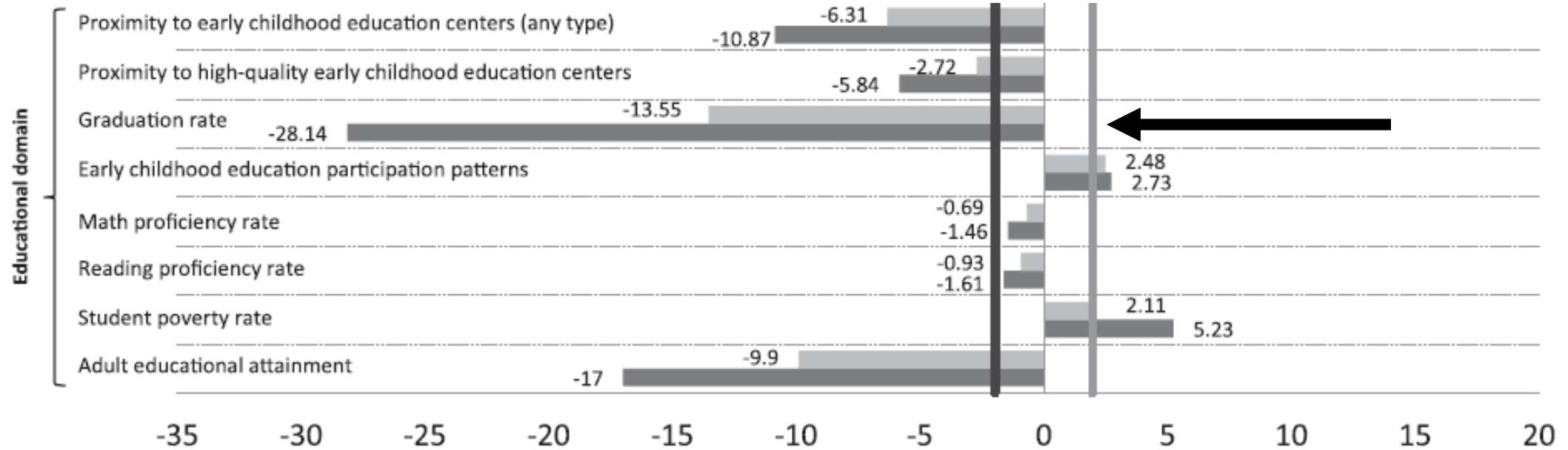
Asthma Hospitalizations and Utilization in Cincinnati, COI 1.0



Beck A.F, et al., J Pediatr 2017;190:200-206.



Asthma Hospitalizations and Utilization in Cincinnati, COI 1.0



Beck A.F, et al., J Pediatr 2017;190:200-206.

■ Asthma hospitalization

■ Asthma utilization

— 1.96

— -1.96

Key Differences from COI 1.0 and COI 2.0

- COI Version 1.0

- 19 indicators
- 47,000 census tracts (100 largest metro areas)
- 2010 data
- Data comparable within metro areas
- All indicators weighed equally when combined into the index

- COI Version 2.0

- 29 indicators
- >72,000 census tracts
- 2010 and 2015 data
- Data comparable within and across metro areas, and over time
- Indicators have individual, varying weights based on how strongly they predict health and economic outcomes

From: Noelke C, *et al.*, Child Opportunity Index 2.0
diversitydatakids.org/researchlibrary/research-brief/how-we-built-it2020

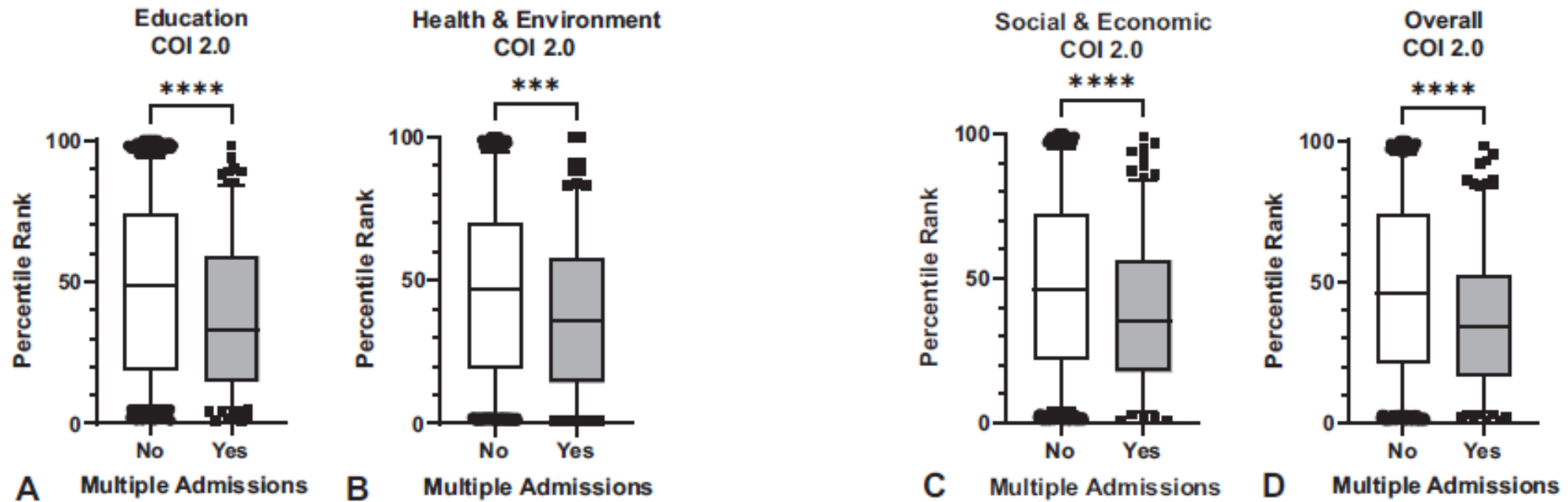
COI v2.0 for Hotspots with Asthma PICU Hospitalizations

	Not Hotspot			Hotspot	
	Median	IQR		Median	IQR
Domain 1: Education	52	23-75		18	10-36
Domain 2: Health and Environment	49	26-73		12	3-44
Domain 3: Social and Economic	49	25.5-73		21	9-46.5
Overall percentile ranking (scale: 1-100)	48	24-75		17	7-43

Grunwell J.R., *et.al.*, J Allergy Clin Immunol Pract 2022;10:981-991.



COI v2.0 for Hotspots with Low COI for PICU Admissions

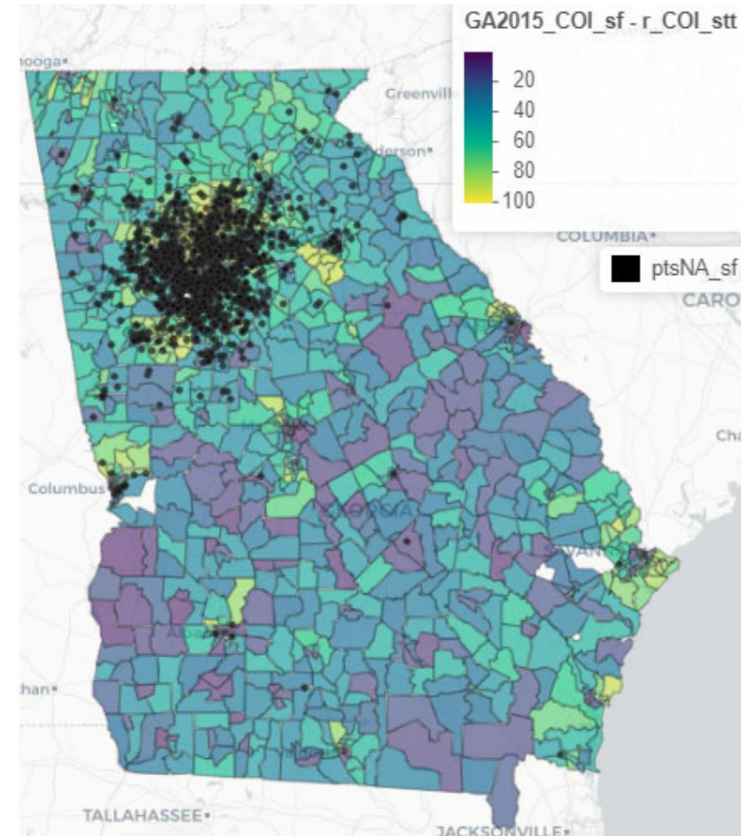


Grunwell J.R., *et.al.*, J Allergy Clin Immunol Pract 2022;10:981-991.

COI v2.0 for Hotspots Covering an Entire State

Geocoded distribution of PICU hospitalizations.

Covers the entire state and not just metropolitan areas.

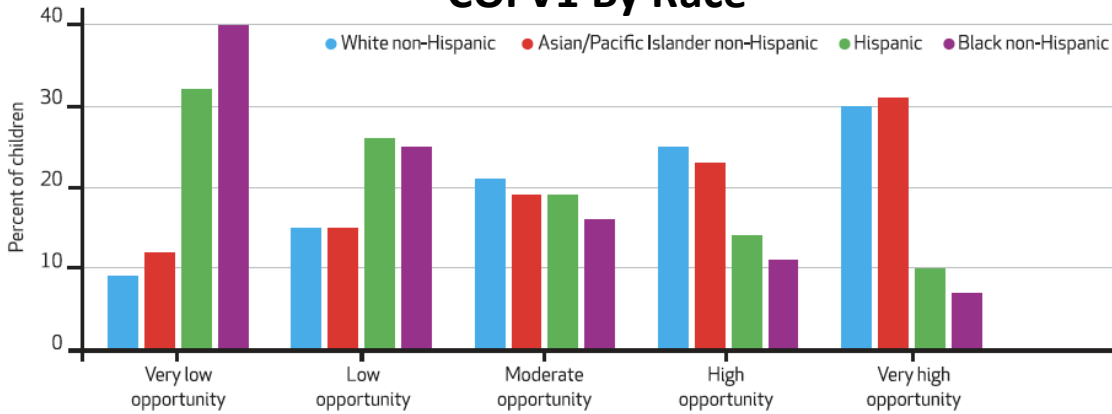


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Summary: Child Opportunity Index (COI) & Asthma

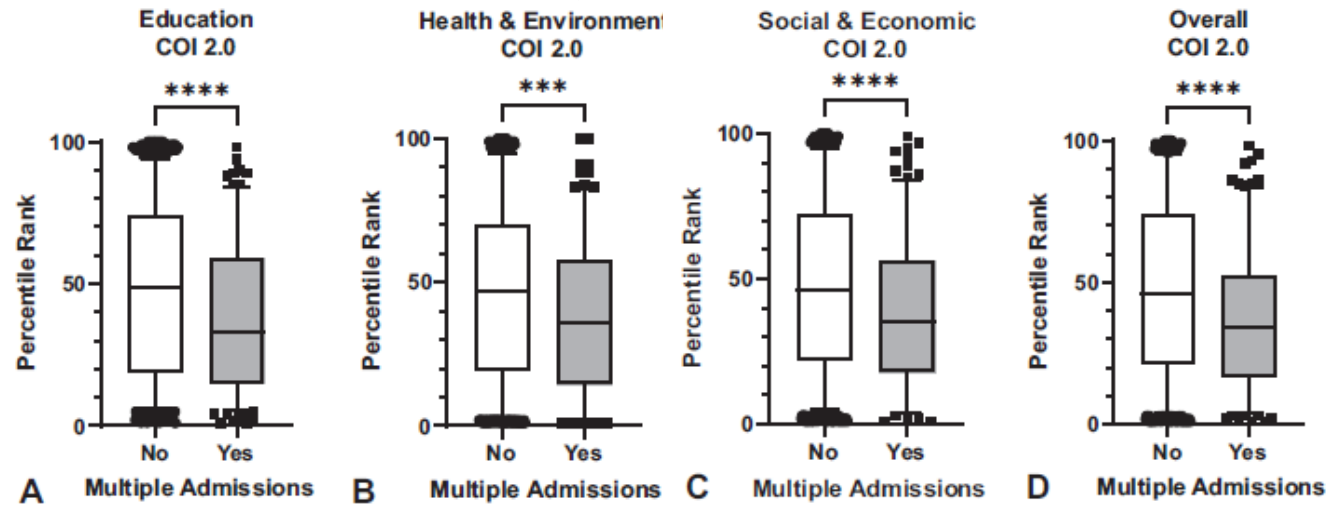
The Child Opportunity Index (COI) is a “population-level surveillance system of child *neighborhood opportunity*” defined as “resources conducive to healthy child development”. General asthma and PICU hospitalizations are associated with poor COI V1 & V2.

COI V1 By Race¹



COI V1 Category ²	Number of Census Tracts (n)	Percentage of Census Tracts (%)
Very Low	53	23.9
Low	39	17.6
Moderate	42	18.9
High	41	18.5
Very High	47	21.2
	Hospitalized Asthmatics (n)	Hospitalized Asthmatics (%)
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Asthma PICU Hotspots related to COI V2 Domains²



¹Acevedo-Garcia D., *et al.*, Health Aff 2014;33:1948.

²Beck A.F, *et al.*, J Pediatr 2017;190:200.

³Grunwell J.R., *et al.*, J Allergy Clin Immunol Pract 2022;10:981.

Are access to healthcare and socioeconomic factors being studied in EGIDs?

- Existing data is limited, but some tools are available to evaluate how socioeconomic factors and access to healthcare affect EGID care.
- The Childhood Opportunity Index (COI) measures and maps the quality of resources and conditions that matter for children to develop in a healthy way in the neighborhoods where they live.
- The COI has been used to study pediatric asthma.
 - Factors including high foreclosure rates and low levels of education may increase the risk for asthma-related hospitalization and need for healthcare.
 - Living closer to a healthcare facility may decrease the risk for asthma-related hospitalization and need for healthcare.
- The COI may be a tool that can help us understand how access to healthcare, education, and socioeconomic status affect patients with EGIDs in the US.
- CEGiR is actively researching how these factors influence care of patients with EoE who go to the emergency room for a food impaction.