Social Determinants of Health and Disparities

Using Address Information to Identify Hardships Reported by Families of Children Hospitalized With Asthma

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Abstract

Objective: Socioeconomic hardship is common among children hospitalized for asthma but often not practically measurable. Information on where a child resides is universally available. We sought to determine the correlation between neighborhood-level socioeconomic data and family-reported hardships.

Methods: Caregivers of 774 children hospitalized with asthma answered questions regarding income, financial strain, and primary care access. Addresses were geocoded and linked to zip code-, census tract-, and block group-level (neighborhood) data from the US Census. We then compared neighborhood median household income with family-reported household income; percentage of neighborhood residents living in poverty with family-reported financial strain; and percentage of neighborhood households without an available vehicle with family-reported access to primary care. We constructed heat maps and quantified correlations using Kendall rank correlation coefficient. Receiver operator characteristic curves were used to assess predictive abilities of neighborhood measures.

Results: The cohort was 57% African American and 73% publicly-insured; 63% reported income <$30,000, 32% endorsed ≥4 financial strain measures, and 38% reported less than adequate primary care access. Neighborhood median household income was significantly and moderately correlated with and predictive of reported household income; neighborhood poverty was similarly related to financial strain; neighborhood vehicle availability was weakly correlated with and predictive of primary care access. Correlations and predictions provided by zip code measures were similar to those of census tract and block group.

Conclusions: Universally available neighborhood information might help efficiently identify children and families with socioeconomic hardships. Systematic screening with area-level socioeconomic measures has the potential to inform resource allocation more efficiently.

Keywords: asthma; geography; pediatrics; social determinants of health

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What's New

Socioeconomic hardship is common in children hospitalized with asthma. Universal socioeconomic risk screening is challenging to implement in clinical practice. Patient address might be an efficient way to identify at-risk children and allocate social support resources in the inpatient setting.

Social risk factors related to socioeconomic status and access to care affect health outcomes.[1,2] Inequalities in pediatric asthma-related morbidity are largely driven by socioeconomic hardships and other social determinants of health (SDH),[3–6] and children hospitalized with asthma are disproportionately from disadvantaged backgrounds and neighborhoods. The hardships faced by many of these children and their families might be difficult to identify although they might be amenable to interventions. However, many of the most successful interventions are multifaceted and resource-intense.[7–9]

Universal implementation of such interventions might be cost-prohibitive; therefore, targeting interventions to the most appropriate populations is essential. Determining the best ways to efficiently target and allocate resources

can be a challenge. One approach to risk assessment, identification, and subsequent stratification is an in-depth social history of factors that place children at risk for worse outcomes and might be amenable to intervention (eg, financial hardships or strain, inadequate housing, barriers to accessing preventive care).[10,11] However, universal comprehensive screening in a busy clinical setting, such as the inpatient asthma unit, might not be feasible. It might also be the case that parents or caregivers are not present at a time when screening can take place.

With such challenges in mind, the use of area-based socioeconomic measures, connected to a patient's street address, has the potential to guide or tailor risk assessments. Such measures have shown promise as proxies for socioeconomic status in understanding health risk for adult patients at the population level.[12–14] Less is known regarding the utility of such measures in pediatrics; however, studies have shown their potential utility in population-level assessment of health outcomes and in the characterization of the home environment.[15,16] Still, there remains only limited evidence of what these area-based measures are proxies for and how they might be used clinically.

Thus, our first objective was to determine the correlation of neighborhood-level, area-based socioeconomic data to analogous family-reported hardships in a cohort of children hospitalized with asthma. Specifically, we sought to compare: 1) neighborhood median household income with family-reported household income; 2) neighborhood poverty rates with family-reported household financial strain; and 3) neighborhood vehicle availability with family-reported primary care access. Clearly, neighborhoods can be defined in multiple ways, and different neighborhood definitions might lead to varying correlations with family-level data. Consequently, our second objective was to investigate how correlations varied across different neighborhood definitions. Taking our cue from the Public Health Disparities Geocoding Project,[13,17] we sought to compare zip code, census tract, and census block group with each another. We hypothesized that smaller, homogenous tracts and block groups would correlate better with patient and family data than zip codes.

METHODS

This was a cross-sectional analysis of data collected as part of the Greater Cincinnati Asthma Risks Study (GCARS). GCARS was a population-based, prospective, observational cohort which enrolled 774 children, 1-16 years of age, who were admitted between August 2010 and October 2011 to Cincinnati Children's Hospital Medical Center (CCHMC). CCHMC is an urban, tertiary care referral center that also serves as the primary pediatric inpatient provider for southwestern Ohio, northern Kentucky, and southeastern Indiana.

Details related to GCARS' inclusion and exclusion criteria along with comprehensive demographic information have been previously described.[6] Briefly, patients were identified using the evidence-based clinical pathway for acute asthma or bronchodilator-responsive wheezing. Children were excluded if they had significant respiratory or cardiovascular comorbidity, if they lived outside of the CCHMC 8-county primary service area, or if they had a non-English speaking caregiver (2% of those otherwise eligible). Notably, approximately 60% of those who were eligible were enrolled. The CCHMC institutional review board approved this study.

PATIENT VARIABLES

Upon GCARS enrollment, each caregiver participated in a face-to-face survey with a trained research assistant, completing a 177-item questionnaire, which included questions related to annual household income, markers of financial strain, and primary care access. These particular variables were chosen a priori for the analyses presented herein because lower income, heightened financial strain,[6] and limited primary care access have all been associated with increased readmission risk in children with asthma.[18]

Caregivers reported annual household income within categories (<$15,000; $15,000–$29,999; $30,000–$44,999; $45,000–$59,999; $60,000–$89,999, ≥$90,000). Financial strain was assessed using a series of 7 previously described questions.[19–21] These questions assessed, via self-report, a family's ability to make ends meet, pay rent/mortgage, pay utilities, their need to move in with others because of finances, and ability to borrow money if needed, as well as home ownership and caregiver marital status.[19–21] Strain questions were treated as dichotomous (yes/no, married/not married); the number of positive items was calculated for each patient. Access to primary care was assessed using the access subscale to the Parent's Perception of Primary Care, a series of 4 questions, which is used to assess a family's ability to travel to their doctor, to see their doctor for routine or sick care, and to get help or advice on evenings or weekends. We scored the subscale as previously described; scores ranged from 0 (no access) to 100 (perfect access).[18,22]

NEIGHBORHOOD VARIABLES

We identified area-based variables for each child on the basis of where the patient lived. The reported street address was geocoded or mapped using ArcGIS software version 10.3 (ESRI, Redlands, Calif). Addresses were then linked to corresponding 2010 census geographies: zip code tabulation area (ZCTA), census tract, and census block group. ZCTAs are statistical entities constructed by the US Census Bureau to enable demographic characterization of zip codes (areas defined by the US Postal Service). Zip codes (and corresponding ZCTAs) can be sociodemographically heterogeneous and can vary in size. Census tracts, defined by the US Census in collaboration with local municipalities, are more homogeneous areas of approximately 4000 people that generally align with locally-recognized neighborhood boundaries. Census block groups are smaller still, areas of approximately 1000 people located within census tracts. Each geographic level was then linked to geography-specific, neighborhood-level information