

## COMMENTARY

# Adding a Vital Sign: Considering the Utility of Place-Based Measures in Health Care Settings

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During rounds, you prepare to enter the room of a child who was hospitalized overnight for an asthma exacerbation. You review the chart, taking careful notice of the documented history and the physical examination. You also quickly glance at the child's zip code. This may not be a routine aspect of your care, but this particular zip code stands out. You know that it includes blocks with dilapidated housing conditions, limited access to pharmacies, and unreliable bus routes. You wonder whether this is the reality faced by your patient. This prompts you to more deeply consider your management plans for this child's hospitalization and for their eventual transition to home. How could or should you think about this child's zip code in relation to their medical and social needs? Is it a proxy for their own risks or a reflection of their surroundings? Or is it both? With studies in which measures of a child's neighborhood are linked to adverse postdischarge outcomes<sup>1</sup> and to patient-level social and financial risks themselves,<sup>2</sup> it is becoming increasingly relevant to consider how to interpret and then use such measures during clinical care. As hospitalists grapple with such scenarios and questions, they may begin by considering the extent to which place-based measures, or "geomarkers,"<sup>3</sup> may or may not serve as proxies for patient-level social, economic, and environmental risks.

Geomarkers can approximate risks related to critical social determinants of health (SDH) that are known to be associated with poor health outcomes for conditions like pediatric asthma (eg, readmission).<sup>2,4,5</sup> Still, such place-based measures are not commonly used during clinical encounters. This is despite their potential utility as adjuvants to clinical data, and the reality that patient-level risks rooted in these SDH can be difficult for clinicians to quickly and meaningfully identify. The National Academy of Medicine recently encouraged clinicians to more effectively screen for potentially modifiable social risks, explicitly supporting the integration of SDH-related assessments into electronic health records (EHRs).<sup>6</sup> They also promoted at least the exploration of the use of place-based data (eg, at the zip code, census tract, or census block group level) to approximate the risk of the individual and to guide or tailor risk assessments to under-resourced populations.<sup>2,6-9</sup> That said, there is still much that is unclear about the complex relationships and interactions between patient- and neighborhood-level variables.

In this issue's article by Nkoy et al,<sup>10</sup> the authors completed a retrospective study in which they sought to assess whether the association between neighborhood- or area-level deprivation and key asthma-related outcomes among children hospitalized for exacerbations (length of stay, cost, readmission) would be modified by patient-level

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insurance status (ie, public versus private). The study included children aged 2 to 17 years who were hospitalized at any of 8 hospitals in Utah's Intermountain Healthcare system. Self-pay patients were excluded. For their area-level measure, the authors used the area of deprivation index (ADI).<sup>10</sup> The ADI includes geographic measures at the census block group level from the US Census that are related to education, employment, poverty, and housing. Intermountain Healthcare currently uses the ADI as a proxy measure to facilitate screening for a patient's socioeconomic status and SDH-related risk factors.<sup>11</sup>

Briefly, this study included 2270 study participants who were hospitalized at least once for an asthma exacerbation for a total of 2880 encounters. The cohort was 40% girls, 1761 (61%) patients were privately insured, and most cases were of low severity. Children living in the more deprived areas, as defined by ADI quintiles, were generally more likely to experience longer lengths of stay, higher hospitalization costs, and greater likelihood of 6-month readmission than those living in less deprived areas.<sup>10</sup> These findings are similar to some of our own, which have illustrated analogous associations between area-level socioeconomic measures and adverse pediatric asthma outcomes.<sup>1,12</sup> Nkoy et al<sup>10</sup> went a step further in their assessment of potential interactions between area-level deprivation and patient-level insurance status. They found that after adjustment for patient age, race and/or ethnicity, sex, and disease severity, publicly insured children had longer lengths of stay, higher costs, and higher rates of 6-month readmission than their privately insured peers, including within every ADI quintile. In some cases, those with private insurance in more deprived areas experienced better outcomes than those with public insurance in less deprived areas, although the included analyses do not allow us to conclusively determine the significance of this finding.<sup>10</sup>

A key strength of this study is that the authors make use of the robust data infrastructure available through Intermountain Healthcare. Intermountain is

one of the first health care systems to insert an area-based measure, the ADI, into an EHR and then study its associations with outcomes in hospitalized children. The assessment of how such an area-level variable interacts with a patient-level variable (ie, insurance status) brings up an interesting question as well. A critical next step and opportunity for future inquiry would be to assess whether measures like the ADI add value to clinical decision-making during those hospitalizations.

This study does, however, still carry important limitations that should be considered as we interpret these findings and consider where we can collectively turn in future studies. First, despite being a population sample, the demographics of patients cared for in the Intermountain Healthcare system differ from those cared for in other systems elsewhere across the country, thereby limiting the generalizability of the findings. For example, the majority of included patients were white. The experiences of underrepresented minorities, or those that live in more racially or culturally segregated parts of the country, may experience deprivation in different ways through factors including, but not limited to, disparities in access to health-promoting resources (eg, health care providers, pharmacies), differential exposures to indoor and outdoor pollutants, social isolation, and institutionalized racism.<sup>13,14</sup> Second, it is difficult to know whether it is truly a child's insurance that is modifying the effect between ADI and pediatric asthma outcomes or whether the type of insurance represents a proxy of something else, like limited access. Relevant to this point, the authors found that those who were publicly insured and living in the moderately deprived quintile, ADI 3, had marginally worse point estimates for measured outcomes when compared with those who were both publicly insured and living in the most deprived quintile, ADI 5. Given the degree to which confidence intervals overlapped, this may not be a meaningful difference. However, it may suggest a potential relationship between insurance and access. With established associations between limited access and asthma-related reutilization,<sup>15</sup> it is plausible

that disparate access may be partially driving this finding. Historically, authors of many studies have used public insurance (Medicaid) as a proxy for low socioeconomic status and more limited access. Given these findings and evolving Medicaid eligibility criteria, perhaps private insurance may represent a more meaningful proxy, highlighting those children who have better access to health-promoting resources. Third, the authors indicate that their results show that "poor outcomes of patients living in the most deprived neighborhoods could be due to a disproportionate number of sicker patients living in those neighborhoods." Although we agree that this may well be the case, such a statement raises an important question: why would these patients be disproportionately sick, and what does their mere presence in the neighborhood tell us? Are sick patients more likely to congregate in certain neighborhoods or is it the neighborhoods themselves that lead to more illness through challenges rooted in the SDH?

During hospital-based clinical encounters, we tend to focus our attention on the patient or individual, with more limited attention paid to the neighborhood from which that patient came and to which that patient will return. We suggest that bringing such context to the bedside of the hospitalized child could be an important adjuvant to care. Understanding the relationship between patient- and area-level factors could add critical insight to risk (and asset) assessments, highlighting potential changes in care pathways that support children during their hospitalization as well as during their discharge from the hospital. Perhaps the ADI may be a proxy for limited access that may trigger a clinician to ask more directed questions about a patient's barriers to care. Perhaps the combination of knowing a patient's ADI with their insurance status reveals even a more accurate assessment of access. Alternatively, it may prompt more directed conversations between the inpatient and outpatient teams as discharge nears. Other potentially relevant interventions may include bedside delivery of medications

before discharge or connection to a community health worker that may facilitate connections back to primary care or to other community resources.

Recall the patient introduced earlier. With a robust EHR, you have at your fingertips patient-level clinical information as well as key demographic variables. Alongside this information sits data that characterize the child's neighborhood, potentially representing a proxy measure that helps you identify patients at higher risk for poor health outcomes. This may enhance your view of those key, potentially modifiable factors (eg, limited access, substandard housing) and assets (eg, medication delivery programs, housing code enforcement) that could be mitigated or leveraged as this child seeks to move beyond their acute asthma exacerbation and return to their optimal state of health.

## REFERENCES

1. Beck AF, Simmons JM, Huang B, Kahn RS. Geomedicine: area-based socioeconomic measures for assessing risk of hospital reutilization among children admitted for asthma. *Am J Public Health*. 2012; 102(12):2308–2314
2. Auger KA, Kahn RS, Simmons JM, et al. Using address information to identify hardships reported by families of children hospitalized with asthma. *Acad Pediatr*. 2017;17(1):79–87
3. Beck AF, Sandel MT, Ryan PH, Kahn RS. Mapping neighborhood health geomarkers to clinical care decisions to promote equity in child health. *Health Aff (Millwood)*. 2017;36(6):999–1005
4. Beck AF, Huang B, Simmons JM, et al. Role of financial and social hardships in asthma racial disparities. *Pediatrics*. 2014;133(3):431–439
5. Beck AF, Moncrief T, Huang B, et al. Inequalities in neighborhood child asthma admission rates and underlying community characteristics in one US county. *J Pediatr*. 2013;163(2):574–580
6. Dzau VJ, McClellan MB, McGinnis JM, et al. Vital directions for health and health care: priorities from a national academy of medicine initiative. *JAMA*. 2017;317(14):1461–1470
7. Committee on the Recommended Social and Behavioral Domains and Measures for Electronic Health Records; Board on Population Health and Public Health Practice; Institute of Medicine. *Capturing Social and Behavioral Domains in Electronic Health Records: Phase 1*. Washington, DC: National Academies Press (US); 2014
8. Committee on the Recommended Social and Behavioral Domains and Measures for Electronic Health Records; Board on Population Health and Public Health Practice; Institute of Medicine. *Capturing Social and Behavioral Domains and Measures in Electronic Health Records: Phase 2*. Washington, DC: National Academies Press (US); 2015
9. Bazemore AW, Cottrell EK, Gold R, et al. "Community vital signs": incorporating geocoded social determinants into electronic records to promote patient and population health. *J Am Med Inform Assoc*. 2016;23(2):407–412
10. Nkoy F, Stone B, Knighton A, et al. Neighborhood deprivation and childhood asthma outcomes, accounting for insurance coverage. *Hosp Pediatr*. 2018; 8(2)
11. Knighton AJ, Savitz L, Belnap T, Stephenson B, VanDerslice J. Introduction of an area deprivation index measuring patient socioeconomic status in an integrated health system: implications for population health. *EGEMS (Wash DC)*. 2016;4(3):1238
12. Beck AF, Huang B, Chundur R, Kahn RS. Housing code violation density associated with emergency department and hospital use by children with asthma. *Health Aff (Millwood)*. 2014; 33(11):1993–2002
13. Alexander D, Currie J. Is it who you are or where you live? Residential segregation and racial gaps in childhood asthma. *J Health Econ*. 2017; 55:186–200
14. Wilson WJ. Why both social structure and culture matter in a holistic analysis of inner-city poverty. *Ann Am Acad Pol Soc Sci*. 2010;629(1):200–219
15. Auger KA, Kahn RS, Davis MM, Beck AF, Simmons JM. Medical home quality and readmission risk for children hospitalized with asthma exacerbations. *Pediatrics*. 2013;131(1):64–70