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# Where Population Health and Health Equity Intelligence Meet: Data Visualization to Draw Connections Between Area Deprivation Index and Health Literacy

Paul Arredondo, MS, Angela Hagan, PhD, MPA, Candy Magaña, MPA, Whitney Bransom, BS,  
Stephanie Franklin, MPS, PMP, and J. Nwando Olayiwola, MD, MPH, FAAFP

## Introduction

**A**T THE PEAK of the COVID-19 pandemic, our nation, and many other nations, were tasked with using population health intelligence to make important decisions. Throughout the pandemic, COVID-19 incidence and mortality rates were more pronounced in minority and marginalized communities, further highlighting the need to better identify and address long-standing disparities in health care.<sup>1</sup> One way to address this issue is through population health dashboards and intelligence tools, which can help provide insight to understand social and structural determinants of health. These dashboards were paramount in directing resources for pandemic needs; however, their role in elucidating health disparities and identifying where health inequities exist extends far beyond COVID-19.

One health disparity of interest is that of health literacy, which is the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others.<sup>2</sup> It is estimated that 36% of US adults have some difficulty understanding and reading health information.<sup>3</sup> Limited health literacy is a key driver of preventable emergency department visits,<sup>4</sup> hospitalizations,<sup>5</sup> and disengagement from the health care system.<sup>6</sup> Limited health literacy is estimated to cost the US economy between \$106 billion and \$238 billion every year,<sup>7</sup> and result in \$4.8 billion annual administrative cost burden for payers.<sup>8</sup>

Given the importance of health literacy on clinical outcomes, health care costs, and utilization, the Health Equity and Social Impact team at Humana sought to obtain population level insights into health literacy, as well as its relationship to other societal factors that influence health in the communities in which our patients reside. However, few tools with a comprehensive view of community-level health

literacy were readily available that could inform our allocation of resources, program design, and innovative solutions.

## Current Data Set Review and Limitations

There are some publicly available data sets and intelligence tools that provide insights into health literacy or social risk factors, but few that do both. Two valuable tools—the University of North Carolina’s (UNC) Health Literacy Map and the Area Deprivation Index (ADI)—provide good options from which to draw these insights. The UNC Health Literacy map is based off a predictive model from the 2003 National Assessment of Adult Literacy (NAAL) and variables from the 2000 Census and American Community Survey (ACS) that include age, race/ethnicity, education, gender, marital status, poverty status, metropolitan statistical area, language spoken at home, and number of years residing in the United States.

Using these variables and the NAAL as reference, map scores were generated on a national scale and represented as quartiles.<sup>9</sup> The ADI is a measure created by the Health Resources and Services Administration and allows for rankings of neighborhoods by socioeconomic disadvantage in a region of interest (eg, at the state or national level). The ADI index was developed using variables taken from the 2020 ACS and includes domains such as education, income/employment, housing, and household characteristics.<sup>10</sup> It can be used to inform health delivery and policy, especially for the most disadvantaged neighborhood groups.

Unlike the UNC health literacy index, the ADI does not include race/ethnicity as a measure. Some limitations of these data sets are that the UNC health literacy index was visualized as census tracts and supplied no other data,<sup>11</sup> and the ADI score represents a single zip code only.<sup>10</sup> Finally, a challenge with some public health data sets and tools is

that units of measurement and the indicators selected are specified for that source’s purpose only. Layering complementary data sets can provide a more comprehensive profile of a given patient population.

**Layering Data for Health Literacy Visualization**

To identify opportunities to improve access to and quality of care received by patients with limited health literacy, it is necessary to identify who may be experiencing health literacy barriers and where they are located. Currently, individual-level health literacy data, either through screening or medical coding, is sparse; however, community- or population-level data may be used to identify geographic areas of focus.

Layering population health data sets to explore and understand where limited health literacy may be impacting patients and how that coincides with health plan membership distribution informs the design and implementation of effective programming and distribution of resources. For the creation of this dashboard on patient location and health literacy, the UNC health literacy map scores from census tracts were transformed to a zip code based data set with geographic location data of Humana’s Medicare Advantage (MA) populations, using zip code tabulation areas to visualize health literacy scores in markets. Next, zip code data from the Agency for Healthcare Research and Quality’s Social Determinants of Health data set, which contains >200 sociodemographic indicators, were matched to gain a more complete view of community composition.

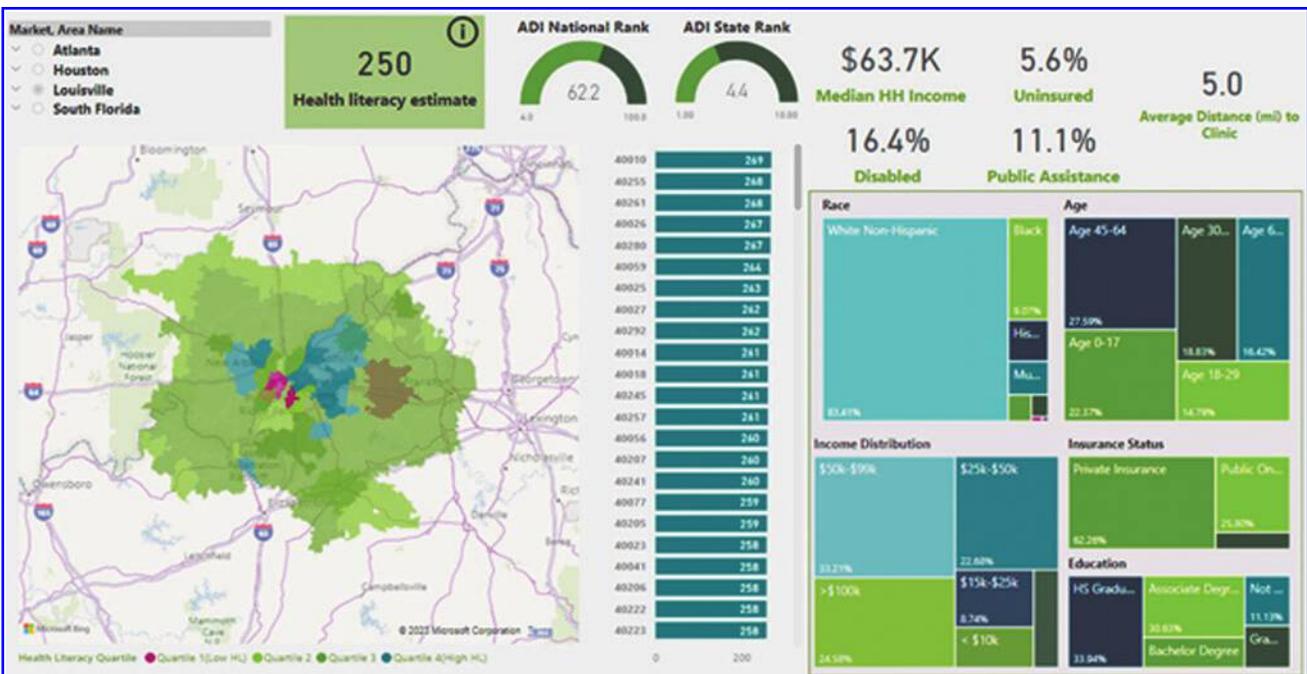
Finally, the ADI was mapped to 4 selected markets of interest to visualize both health literacy and areas that score high on the ADI. This layering of data sets created a comprehensive view, in dashboard format, of how health literacy may be influencing patients in key markets (Fig. 1). In the

dashboard, markets comprised business defined plan service areas for MA patients and had potential to include hundreds of zip codes. With the health literacy scores visualized as a heat map, and the added context of other demographic socio-economic indicators may elucidate areas for further exploration to inform strategy.

**Future Directions**

The emergence of business intelligence technology provides health care organizations with powerful tools to drive health equity and improve population health. Health care organizations can enhance their understanding of and strategies to address patient barriers to health engagement and outcomes such as health literacy by layering publicly available data sets with their own service area and patient data. Leveraging information about locations where limited health literacy is more prevalent can provide health literacy risk information to clinical care teams so they may consider screening individual patients and documenting relevant International Classification of Diseases, 10th edition or Logical Observation Identifiers Names and Codes.

In addition, plans and providers may integrate health literacy screening through community health workers caring for patients in high-risk areas, giving them tools for individual screening and resource provision in areas where it is most needed. Finally, as patient-facing materials from pharmacy and clinical segments are adapted, this geographic knowledge is helpful for planning phased rollouts of new health literacy adjusted materials. These intelligence tools enable prioritization of which markets/areas to implement new features and programs first. Health systems and other health care stakeholders have the opportunity to utilize intelligence layering as a powerful decisions-making tool related



**FIG. 1.** Humana markets and health literacy dashboard. ADI, Area Deprivation Index.

to understanding their patients social and structural barriers to care, application of screening tools, allocation of resources, and creation of more patient-centered interactions and materials can utilize this sort of intelligence layering as a powerful decision-making tool.

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Address correspondence to:  
*Paul Arredondo, MS*  
*Health Equity Social Impact (HESI)*  
*Humana, Inc.*  
*500 West Main Street*  
*Louisville, KY 40202*  
*USA*

*E-mail: parredondo@humana.com*