HIDI HealthStats

Statistics and Analysis From the Hospital Industry Data Institute

"Population health has been defined as 'the health outcomes of a group of individuals, including the distribution of such outcomes within the group.' Measuring population health and its distribution can unite groups across sectors around a set of clear, defined goals."
– Vuik, Siegel, and Darzi, Health Affairs Blog, March 17, 2017[x]

Background

The places where we live, work, learn and play affect our health. The more that is known about these places, the better clinicians and community-based partners can identify and address the influence of these factors on health.

Population health improvement requires communitywide partnerships to address the social, economic, environmental, clinical and behavioral factors that affect health and lead to poor health outcomes. In standardized comparative measures across these domains, Missouri has been ranked below the national average for overall health since 1990.[i]

Significant data is available on health factors and outcomes at the county level. However, these political subdivisions often are too large to effectively identify population health challenges. Increased attention is being given to geographic variation in health at the subcounty level.[ii]

The Affordable Care Act expanded emphasis on population health, transitioning the model of health care beyond the hospital campus and into patients' communities. As a result, providers are focusing on upstream[iii] social, environmental and contextual determinants of health that often result in poor physical and emotional downstream health outcomes. The ACA has accomplished a great deal in moving traditional health care toward an intersection with the disciplines of public health.

The concept of an individual's ZIP code being a more powerful predictor of health than their genetic code is gaining widespread acceptance in the medical community. The population health movement also has led to an increased demand for meaningful community-based health and sociodemographic data

"The top three community health needs assessment issues identified in Missouri are: access to care; chronic diseases, including diabetes, heart disease and obesity; and behavioral health. Management and improvement of these health challenges requires a commitment from both health care and community leaders. Hospitals' first CHNA process provides a baseline for community-centered partnership on population health improvement. As hospitals engage in the next cycle of CHNAs, MHA has tools and resources to assist in the process."
– Peter Rao, MHA's Vice President of Quality Evaluation & Program Development

among hospitals. Despite the many unknowns surrounding the future of the health care system, the move from volume to value is expected to continue. As a result, the demand for population health data is expected to grow.

Community health needs assessments are perhaps the most common strategy hospitals use to identify the upstream clinical and social factors affecting downstream health outcomes in their service areas.

CHNAs provide hospitals an opportunity to identify and form relationships with other community stakeholders for the purpose of improving population health. The assessments are based in part on the evaluation of data that identify pressing health needs and factors, such as poverty that contribute to these needs in the community. Unfortunately, a common barrier to the successful identification of a community's most acute need is the lack of data granular enough to identify localized areas in most need of intervention. Typically, health-related data are only available at the county level which, in Missouri, range in population size from nearly one million in St. Louis County, to just 2,024 in Worth County.[iv]

A widely used source of secondary data for hospital CHNAs come from the Robert Wood Johnson Foundation's County Health Rankings & Roadmaps program developed by researchers at the University of Wisconsin Public Health Institute.

CHR offers a robust set of measures and data on social and clinical health factors for counties in the U.S. The data are gathered from multiple sources and grouped into two domains — health factors and health outcomes. All health factors and health outcomes measures are standardized within each state, weighted, and then converted into indices to rank each county for comparative purposes within the same state. The 2017 CHR data for Missouri resulted in Platte County being ranked best in the state for health outcomes and second best for health factors, while Pemiscot County was ranked last in each domain. The population health model underlying the CHR measurement construct suggests that local policies and programs influence health factors within populations, such as rates of behavioral traits and socioeconomic conditions. These, in-turn, result in health outcomes, which are measured by quantity and quality of life, or how long and how well individuals live.

The narrow availability of health data at the subcounty level reduces opportunities to target scarce interventional resources to communities with the greatest need. While county-level health data are widely available, they are subject to ecological fallacy — the false assumption that individuals share the same characteristics of the larger geographic group to which they belong.[vi] A common concern for hospitals is basing their CHNAs solely on county-level data because they are perceived as too large to meet the definition of a community, and county-level data will be less likely to produce measurable differences following a community health intervention.

With these limitations in mind, the Hospital Industry Data Institute has been working to expand the availability of subcounty level community health data to improve health outcomes in Missouri by informing health improvement initiatives and the targeted allocation of scarce population health resources.

Missouri ZIP Health Rankings Project

A recent collaboration between researchers at HIDI, the Washington University School of Medicine and BJC HealthCare, provided a unique approach to measuring community health at the ZIP-code level using hospital discharge and census-based data applied to the CHR model of population health. The project was funded by The Robert Wood Johnson Foundation through a 2015 County Health Rankings Research Grant award. The research team was guided by advisory committee members from academia, local public health, hospital community benefit specialists and

"The Missouri ZIP Health Rankings project has been focused from its beginning on addressing the needs of people in Missouri who are working to improve the health of our communities. It's been important for us to hear directly from our advisory group and others about what kinds of information they need to move their work forward. Our plans for the future include making these data available through a publically accessible data platform, continuing to engage Missouri stakeholders to ensure these data are meeting their needs, and evaluating the performance of the ZIP Health Rankings model over multiple years, and potentially across other states."

— Elna Nagasako, M.D., Ph.D., MPH Missouri ZIP Health Rankings Project Principal Investigator

Figure 1: Missouri ZIP Health Rankings Compared to the Robert Wood Johnson Foundation's County Health Rankings
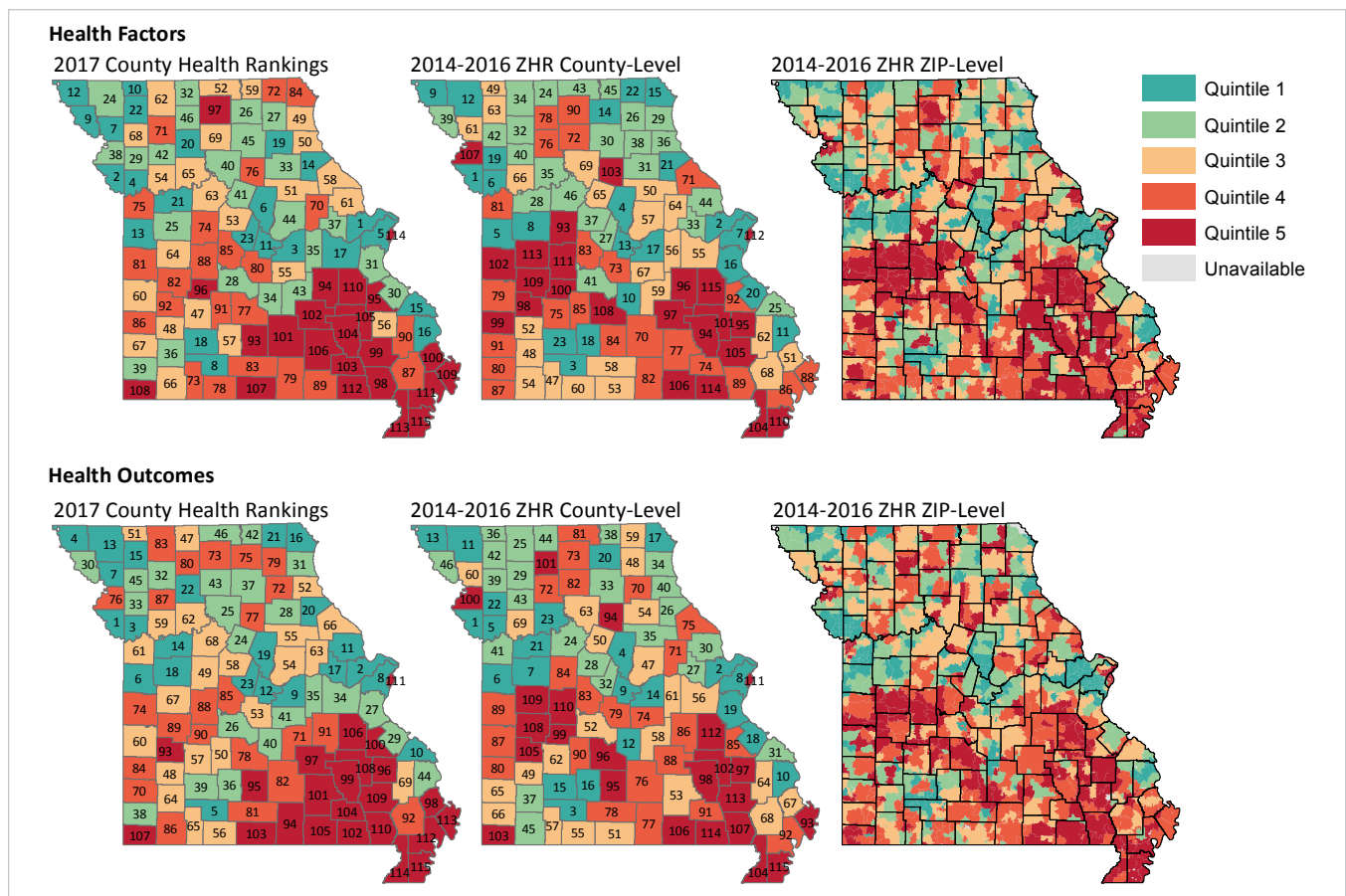
Source: Hospital Industry Data Institute

philanthropic organizations. Findings of the study were presented at the annual meeting of the American Public Health Association and published in the *Journal of Public Health Management and Practice*.[vii]

The ZIP Health Rankings project fits hospital discharge and sociodemographic data into each domain and subdomain of the CHR population health model listed below.

- Health Outcomes
  - Length of life
  - Quality of life
- Health Factors
  - Health Behaviors
  - Clinical care
  - Socioeconomic factors
  - Physical environment

Hospital discharge data are compiled throughout a three-year study period, and counts of selected diagnoses are aggregated at the ZIP-code level for each subdomain. The counts are then calculated as rates of the affected population group for each measure evaluated, and then standardized with z-scores. Principal components analysis is then used to derive ranked indices for each ZIP code in Missouri with respect to each CHR domain — health outcomes and health factors — and each of the subdomains contained therein. Principal components analysis specializes in detecting and highlighting variation in data across multiple dimensions. The ZIP-code level scores are aggregated up to the county level using an apportionment

geographic correlation engine weighted by population to account for overlapping boundaries between ZIP codes and counties. The county level estimates derived from the ZHR scores are used to compare these results to those published by CHR.

Figure 1 includes maps of health factor and health outcome quintiles and ranks from the 2017 CHR data compared to the recently updated Missouri ZIP Health Rankings data at both the county and ZIP-code levels. The updated ZHR data draw from 2014-2016 inpatient, outpatient and emergency department discharges for Missouri residents, and 2015 Nielsen Pop Facts Premier data.

The ZIP-level results were reapportioned to the county level using MABLE GeoCorr v.14 to compare the ZHR results with the 2017 CHR data. Across all 115 Missouri counties, the health factors domain of the two rankings systems shared a Pearson's correlation coefficient of 0.76, with 58 percent of the variance in the ZIP-derived scores being explained by the CHR scores. For health outcomes, the correlation was 0.78 with an R^2 value of 0.61 (Figure 2).

Evaluating agreement across quintiles between the ZHR and CHR measures resulted in 36 percent of Missouri counties falling in the same quintile for the health factors domain, and 86 percent were within one quintile in each measurement construct. For the health outcomes domain, 43.5 percent of counties were in the same quintile according to both the CHR and ZHR measures, while 87 percent were within one quintile (Table 1).

Figure 3 demonstrates the subcounty variation observed in St. Louis city and county in the updated ZHR data. The region as a whole features a wide degree of variation in health factors and health outcomes at the ZIP-code level. Within the St. Louis region, the range for health factors was first in Chesterfield out of 955 ranked ZIP codes statewide, to 944th in ZIP code 63113 which is the Ville neighborhood in North St. Louis City. For health outcomes, the range was first to 950th in the same two neighborhoods.

Figure 2: Scatterplot of ZIP-Derived Health Factors and Health Outcomes Compared to 2017 County Health Rankings for 115 Missouri Counties
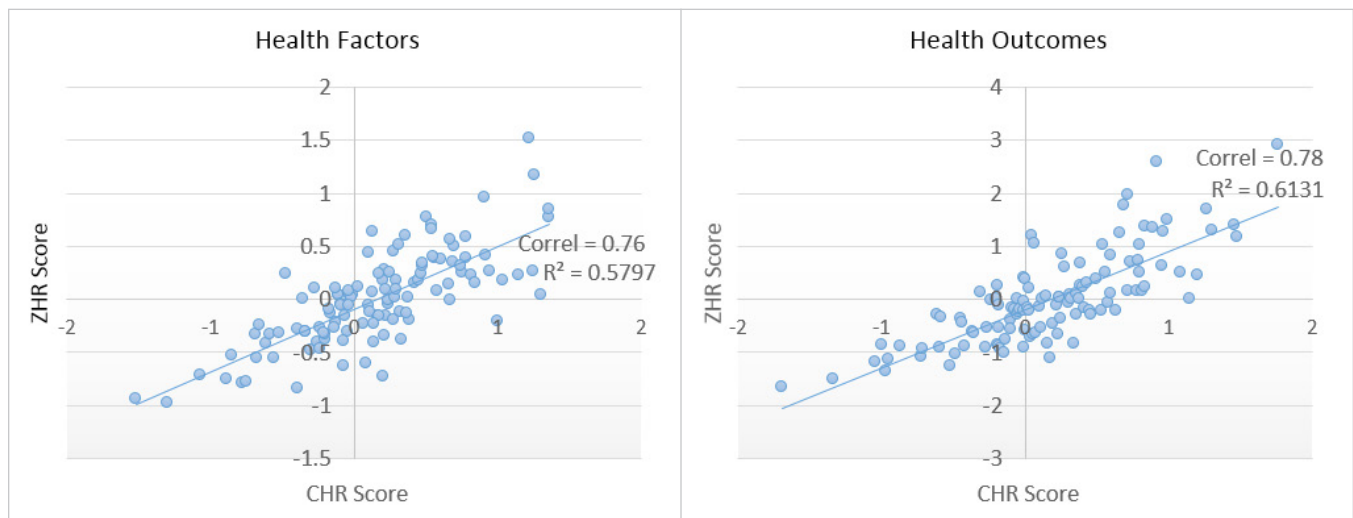
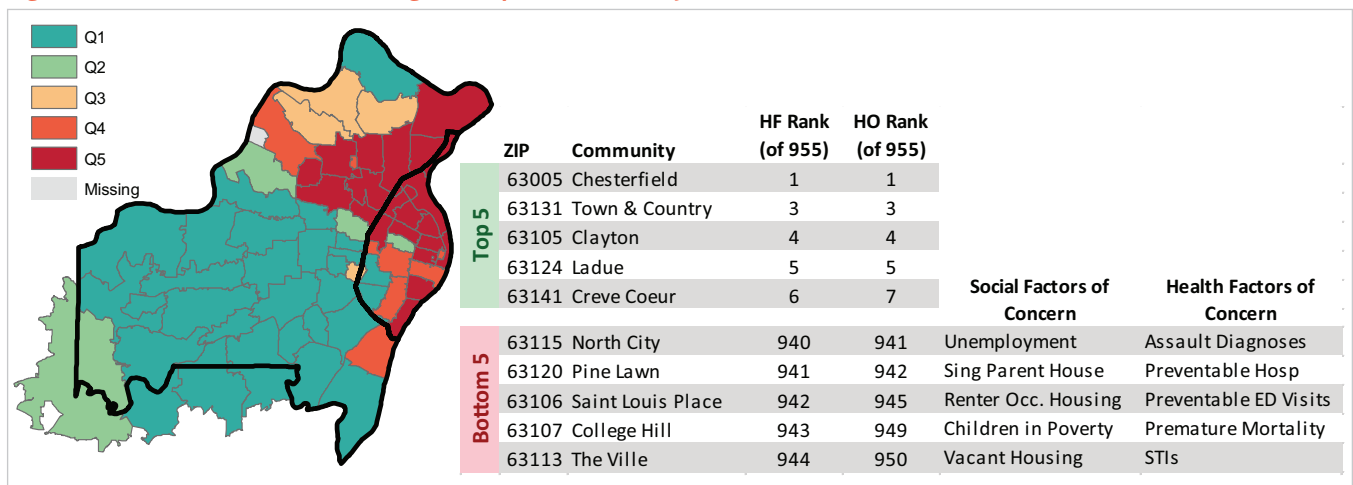*Source: Hospital Industry Data Institute*

Table 1: Quintile Agreement Matrices for ZIP-Derived Health Factors and Health Outcomes Compared to 2017 County Health Rankings for 115 Missouri Counties

Health Factors	CHR Q1	CHR Q2	CHR Q3	CHR Q4	CHR Q5
ZHR Q1	13	7	1	2	0
ZHR Q2	5	7	10	1	0
ZHR Q3	4	6	5	6	2
ZHR Q4	1	2	5	5	10
ZHR Q5	0	1	2	9	11
Percent with same Q agreement			35.7%		
Percent with +/-1 Q agreement			86.1%		

Health Outcomes	CHR Q1	CHR Q2	CHR Q3	CHR Q4	CHR Q5
ZHR Q1	14	7	1	1	0
ZHR Q2	6	6	8	3	0
ZHR Q3	2	7	7	4	3
ZHR Q4	1	3	6	8	5
ZHR Q5	0	0	1	7	15
Percent with same Q agreement			43.5%		
Percent with +/-1 Q agreement			87.0%		

Source: Hospital Industry Data Institute

Figure 3: Missouri ZIP Health Rankings Example of Subcounty Variation in the St. Louis Area

	ZIP	Community	HF Rank (of 955)	HO Rank (of 955)	Social Factors of Concern	Health Factors of Concern
Top 5	63005	Chesterfield	1	1		
	63131	Town & Country	3	3		
	63105	Clayton	4	4		
	63124	Ladue	5	5		
	63141	Creve Coeur	6	7		
Bottom 5	63115	North City	940	941	Unemployment	Assault Diagnoses
	63120	Pine Lawn	941	942	Sing Parent House	Preventable Hosp
	63106	Saint Louis Place	942	945	Renter Occ. Housing	Preventable ED Visits
	63107	College Hill	943	949	Children in Poverty	Premature Mortality
	63113	The Ville	944	950	Vacant Housing	STIs

Source: Hospital Industry Data Institute

Data Availability

In June 2017, the MHA Health Institute Board of Directors approved funding to build a community health data platform designed to assist member hospitals and other stakeholders in conducting CHNAs. The aim of the project is to improve health outcomes by enhancing the availability of community health data at the county- and ZIP-code levels in Missouri to inform health improvement initiatives and the allocation of scarce population health resources. The platform will be publicly available and intended for use by hospitals, local public health agencies, grant writers, researchers and community action agencies. Staff from HIDI and the Washington University School of Medicine evaluated various community health data platforms. The Community Commons platform, hosted by the University of Missouri, Center for Applied Research and Environmental Systems, offers a customizable solution in terms of data display, accessibility and co-branding. The platform will feature customizable graphic design and content displays, interactive mapping functionality of content at both county and ZIP levels; graphic and tabular data visualization; and expandable data layers to accommodate novel data sources, such as locations of hospitals, federally-qualified health centers, local public health agencies, and access to other community-based amenities that influence health, such as access to groceries, exercise, and transportation. The platform will allow users to evaluate data to prioritize health and social factors in defined services areas, design customized reports, and generate downloadable content in editable formats (Word, PDF, Excel) to assist in preparing personalized CHNAs. The platform will be available by early 2018 to assist hospitals in the next CHNA cycle.

Violence is a severe public health threat in parts of the St. Louis region − the city's north side in particular. As this brief was being written, a new analysis by *FiveThirtyEight* found that St. Louis is projected to have the highest murder rate in the country again in 2017. Throughout 2016, the murder rate in St. Louis was an outlier at 59.3 per 100,000, followed by 51.2 in Baltimore, and doubling the rate of 27.9 in Chicago.[viii] Each of the bottom five ZIP codes in St. Louis saw rates of assault-related hospital utilization that were more than 3.5 standard deviations higher than the statewide rate − this measure includes gun-related injuries and deaths. A recent analysis by *The Guardian* found that a four-mile stretch of Natural Bridge Avenue in North St. Louis was the most violent place in the country for gun violence.[ix] Natural Bridge runs directly through three of the five highest risk ZIP codes in St. Louis, and it borders the other two by a few blocks.

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