2015 Healthy Marketplace Index Report

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Introduction

Just as there are many types of medical tests to assess a person's health, there are numerous measures of economic performance that can be used to evaluate "economic health." The Health Care Cost Institute (HCCI), with grant funding from the Robert Wood Johnson Foundation (RWJF), has developed a series of metrics, collectively referred to as the Healthy Marketplace Index (HMI), to assess the economic performance of health care markets, both across markets and within markets over time. This report describes the technical details of the calculations as well as the results.

The metrics are related to health care prices, productivity, and competition and were calculated for the years 2011 through 2013. These metrics were developed following an HMI prototype development grant from RWJF and numerous discussions with leading health care industry experts and researchers. This report provides baseline measurements of economic aspects of health care markets. These metrics are intended to be the starting point for ongoing tracking of health care market "health" and a reference for identifying areas that warrant further investigation.

The HMI metrics focus on the population of individuals with employer-sponsored insurance (ESI), which accounted for nearly 60 percent of the U.S. population in 2011.[1] All metrics are calculated using HCCI's administrative claims data base, which includes health insurance membership and claims data for more than one-fourth of the national ESI population younger than 65—more than 40 million individuals per year. The metrics were developed on the basis of the feasibility of calculating measures for numerous market areas and of the ability to provide practical information for policy makers, employers, and researchers.

Data

Market areas

There were many possible market definitions for health care services that could have been used for the HMI. Core-Based Statistical Areas (CBSAs) were chosen for feasibility and because of their policy relevance. CBSAs are large enough to provide sufficient sample sizes, and they have well-defined, mutually exclusive geographic boundaries allowing for the construction of distinct areas for analysis and comparison.[2] CBSAs are defined by the Office of Management and Budget and commonly used by the U.S. Census Bureau. Every CBSA

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[1] Robert Wood Johnson Foundation, "Number of Americans Obtaining Health Insurance Through an Employer Declines Steadily Since 2000," April 2013. Available at http://www.rwjf.org/en/about-rwjf/newsroom/newsroom-content/2013/04/number-of-americans-obtaining-health-insurance-through-an-employ.html.

[2] Originally, health exchange rating areas were considered for the geographic market definition. In most states, rating areas are collections of counties similar to CBSAs, but the assignment of counties to rating areas differs by state, and rating areas do not appear to be analogous or comparable across states. For example, Florida has 67 rating areas for 67 counties. Texas has only 26 rating areas for 255 counties. Additionally, small rating areas (i.e., composed of one or only a few counties) and rural rating areas (i.e., composed of rural counties with small populations) resulted in numerous rating areas with insufficient sample sizes for HMI calculations.

includes a core urban area consisting of one or more counties, and may include adjacent counties with a "high degree of social and economic integration (as measured by commuting to work) with the urban core."[3] Calculating the HMI metrics at the CBSA level assumes that the relevant economic environment (e.g., the demand and supply of health care services) is related to the social and economic integration inherent in the CBSA geography definitions.[4]

Population

The HMI analysis cohort includes all individuals in the HCCI data, ages 18 to 64 with ESI for the years 2011, 2012, and 2013. All CBSAs where the total 18- through 64-year-old ESI population is greater than 100,000, and HCCI data includes at least 25 percent of the membership were included.

All the HMI metrics were calculated with HCCI's analytical research data set. Unlike Medicare claims, no source exists for all ESI claims data in the US; however, the HCCI data set is one of the largest and most comprehensive sources of ESI data. HCCI's data are composed of statistically de-identified administrative claims compliant with the Health Insurance Portability and Accountability Act (HIPAA) of 1996 for approximately 27 percent of the national ESI population younger than 65 and include claims from all 50 states and the District of Columbia for more than 40 million individuals per year. [5]

The HMI analysis cohort includes all adult ESI members ages 18 to 64 for the years 2011, 2012, and 2013. The data were limited to CBSAs where the total 18- through 64-year-old ESI population is greater than 100,000, and HCCI data included at least 25 percent of the membership. The percent of data coverage in a CBSA was estimated by dividing HCCI member years (i.e., total member months divided by 12) by a CBSA level estimate of the of the total 18- through 64-year-old ESI population from the U.S. Census Bureau's American Community Survey (ACS).[6]

Individuals in the HCCI data were assigned to CBSAs by the five-digit ZIP code in their record in the insurance membership file. The ZIP codes were mapped to counties, which in turn comprise CBSAs. In instances where a ZIP code overlapped a county boundary (or boundaries), ZIP codes were mapped to the county with the largest proportion of ACS 18- through 64-year-old ESI population. Thus, all ZIP codes were assigned to a

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[3] All CBSAs included in this HMI report are metropolitan statistical areas with a population of at least 50,000. United States Census Bureau. "Metropolitan and Micropolitan," Available at: http://www.census.gov/population/metro/.

[4] Hospital referral regions (HRRs) are another common geographic health care market definition. CBSAs were selected over HRRs because the HMI focus on the ESI population and CBSAs defined around a common metropolitan area. HRRs were originally defined by researchers from the Dartmouth Atlas of Health Care to study the use of health care services within the fee-for-service Medicare population. Unlike CBSAs, HRRs include nearly all ZIP codes in the US and potentially include rural areas as well as urban areas. Second, HRRs were defined by assigning ZIP codes to hospital areas based on proportions Medicare hospitalizations. Although some CBSAs and HRRs may largely overlap, many CBSAs include multiple HRRs. For example, the Atlanta CBSA is comprised of 339 zip codes in HCCI data. That set of ZIP codes crosses four HRRs comprised of 665 ZIP codes.

[5] The percentage estimate is based on HCCI's calculation of 2013 membership data compared to The U.S. Census Bureau's American Community Survey 3-year (2010—2012) estimate of the ESI population.

[6] The ACS is an ongoing survey that includes counts of the U.S. population by demographic, social, economic, and housing outcomes in every year. The ACS collects and estimates data as 1-year, 3-year, and 5-year estimates. https://www.census.gov/programs-surveys/acs/

single county, and the mapping of ZIP codes to CBSAs was unique. Additionally, inclusion in the analysis cohort each year was limited to individuals with membership in a single CBSA per year. However, 12 months of membership was not required to be included in the sample.[7]

The HMI full analysis cohort summary statistics are shown in Table 1. Although large variation exists across CBSA populations, the full analysis cohort population is similar across years.[8] Average CBSA membership varies by less than 1 percent between years. The seventy-fifth percentile population is approximately ten times greater than the twenty-fifth percentile however. The correlation coefficient between CBSA membership by year is .999 and significant at the 0.01 level for all pair-wise correlations of years.

Table 1. HMI CBSA-level population summary statistics by year

	2011	2012	2013
Average	326,130	323,284	324,141
Standard deviation	335,857	331,842	331,215
Minimum	42,729	42,829	44,295
25th percentile	68,991	71,907	72,047
50th percentile	151,659	150,090	158,599
75th percentile	435,781	426,911	436,263
Maximum	1,246,798	1,208,954	1,225,998
Correlation with 2011		0.999***	0.999***
Correlation with 2013			0.999***

Source: HCCI, 2015.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.

The analysis cohort CBSA populations are presented by year in Table 2. The largest CBSAs included are Atlanta, Dallas, Houston, and Philadelphia, with approximately 1 million members in each CBSA-year cohort.[9] The smallest are Beaumont, Boulder, Trenton, and Fort Collins, with fewer than 55,000 members in the CBSA-level analysis cohort each year.

[7] Although the ESI population for 3 consecutive years was used the study population it is not a panel data set. In other words, not all members are observed in all years. New individuals enter over time as well.
[8] The existence of differences in population, geography, and socioeconomics, and demographics does not prohibit comparisons across CBSAs but should be kept in mind when making comparisons.
[9] Full CBSA names are listed in Table 2.

Table 2. Employer-sponsored insurance 18-64 year old analysis cohort CBSA populations

CBSA Name	2011	2012	2013
Atlanta-Sandy Springs-Roswell, GA (Atlanta)	995,156	1,009,643	1,006,900
Augusta-Richmond County, GA-SC (Augusta)	65,060	61,955	61,438
Austin-Round Rock, TX (Austin)	357,183	369,092	386,788
Beaumont-Port Arthur, TX (Beaumont)	49,399	50,207	50,940
Boulder, CO (Boulder)	54,065	52,888	53,679
Bridgeport-Stamford-Norwalk, CT (Bridgeport)	146,503	150,090	158,021
Cape Coral-Fort Myers, FL (Cape Coral)	74,277	72,513	72,047
Cincinnati, OH-KY-IN (Cincinnati)	464,845	465,404	473,518
Colorado Springs, CO (Colorado Springs)	73,295	73,646	74,867
Columbus, OH (Columbus)	435,781	418,439	424,292
Corpus Christi, TX (Corpus Christi)	68,991	71,907	75,150
Dallas-Fort Worth-Arlington, TX (Dallas)	1,246,798	1,208,954	1,225,998
Dayton, OH (Dayton)	133,045	122,435	120,883
Denver-Aurora-Lakewood, CO (Denver)	404,778	406,801	420,017
El Paso, TX (El Paso)	61,892	62,957	65,075
Fort Collins, CO (Fort Collins)	42,729	42,829	44,295
Green Bay, WI (Green Bay)	62,389	62,474	66,739
Greensboro-High Point, NC (Greensboro)	96,878	89,709	86,466
Houston-The Woodlands-Sugar Land, TX (Houston)	1,166,289	1,136,413	1,154,889
Jacksonville, FL (Jacksonville)	235,973	220,157	206,240
Kansas City, MO-KS (Kansas City)	305,841	304,071	288,590
Lakeland-Winter Haven, FL (Lakeland)	67,856	63,883	64,475
Lexington-Fayette, KY (Lexington)	117,962	117,047	114,186
Louisville/Jefferson County, KY-IN (Louisville)	291,625	305,090	311,565
Miami-Fort Lauderdale-West Palm Beach, FL (Miami)	697,386	693,461	667,165
Milwaukee-Waukesha-West Allis, WI (Milwaukee)	409,759	394,214	390,786
New Orleans-Metairie, LA (New Orleans)	156,889	150,436	158,599
North Port-Sarasota-Bradenton, FL (North Port)	94,967	95,281	95,309
Omaha-Council Bluffs, NE-IA (Omaha)	113,623	121,064	121,273
Orlando-Kissimmee-Sanford, FL (Orlando)	355,051	335,635	341,742
Palm Bay-Melbourne-Titusville, FL (Palm Bay)	63,297	60,953	59,319
Peoria, IL (Peoria)	63,192	60,703	59,174
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD (Philadelphia)	1,052,490	1,029,730	977,893
Phoenix-Mesa-Scottsdale, AZ (Phoenix)	710,973	719,765	746,108
St. Louis, MO-IL (St. Louis)	453,950	473,003	476,643
San Antonio-New Braunfels, TX (San Antonio)	421,419	426,911	436,263
Tampa-St. Petersburg-Clearwater, FL (Tampa)	550,871	535,687	541,776
Trenton, NJ (Trenton)	54,398	52,952	52,342
Tucson, AZ (Tucson)	151,659	149,027	165,639
Tulsa, OK (Tulsa)	133,807	137,495	126,196
Washington-Arlington-Alexandria, DC-VA-MD-WV (Washington)	868,973	879,755	866,485

Source: HCCI, 2015.

The analysis cohort populations are also generally stable over time within CBSAs suggesting the HMI metrics were calculated for similar populations within each CBSA over time. Twenty-two CBSAs show decreasing populations, and 19 show increasing populations. Between 2011 and 2013, the average change in CBSA population is only -0.34% with a standard deviation of 5.65%. The population decreases, however, occurred in larger CBSAs on average. The average population size of CBSAs with increasing sample sizes was 269,593 in 2011 and 280,722 in 2013. This is substantially less than the average cohort population in CBSAs with decreasing populations (374,495 in 2011 versus 361,639 in 2013). Descriptive statistics of the analysis cohort population changes are shown in Table 3.

Table 3. Summary of HMI analysis cohort population changes 2011 to 2013

	Number of CBSAs	Average change (Standard Deviation)	Minimum change	Maximum change	2011 Average Population (Standard Deviation)	2013 Average Population (Standard Deviation)
Total	41	-0.34% (5.65%)	-12.60	9.22	326,130 (335,857)	324,141 (331,215)
Decreasing	22	-4.76% (3.17%)	-12.60%	-0.29%	374,957 (390,030)	361,639 (381,568)
Increasing	19	4.77% (2.79%)	0.36%	9.22%	269,593 (258,654)	280,722 (264,986)

Source HCCI, 2015.

Noticeable changes in populations are seen in some CBSAs during the observation period: In Austin, Corpus Christi, and Tucson, the analysis cohort population increased more than 8 percent between 2011 and 2013; in Jacksonville, the population decreased more than 12 percent during the same period. The Greensboro and Dayton CBSA populations also decreased by approximately 10 percent and 9 percent, respectively, during the study period. Percentage population changes from 2011 to 2013 are presented for each CBSA in Appendix Table A1.

Methodology

The HMI includes metrics related to three aspects of the economic environment of health care markets: price, productivity, and competition. Price likely affects and is affected by both competition and productivity, but this analysis does not seek to identify the causal impacts or attribute results to particular components of the economic environment. The goal was to define measures that can be feasibly calculated using administrative claims data and reported in such a way that general assessments of health care financing and delivery can be made. Ideally, from the HMI findings, areas for future research and policy will be identified. The metrics and methodology were developed by HCCI researchers on the basis of existing methodologies and in consultation with technical experts in the fields of health economics and health policy and with health care industry leaders.

Price

A major focus of the HMI were the price indices—normalized measures of prices for a set of common services—that allow for easy and suitable comparisons of price levels across markets or within a single market over time. Prices are a relevant measure of market performance because the dynamics of economic activity such as the competitive environment (e.g., hospital and insurer market power and bargaining leverage); supply factors (e.g., medical supplies costs, wage rates, etc.); and demand factors (e.g., population health and health services utilization patterns) all affect prices. Total health care expenditures are determined by a combination of prices and utilization. The price index results are, therefore, informative in understanding the relative importance of prices versus quantities in explaining differences in health care expenditures.

Price index

The HMI includes two price indices: one for inpatient services and one for outpatient services. Each price index holds the set of services fixed but allows the prices to vary between CBSAs. Therefore, differences in the index values can be attributed to prices rather than the types or amounts of services used. An index value equal to 1.00 indicates that, on average, the price level in the CBSA was equal to the price level of the total population for the same service mix. CBSAs with higher than average prices will have index values larger than 1.00, and CBSAs with lower than average prices will have index values less than 1.00.

A price index is based on a common collection or "basket" of goods and services across time and geography so that the results are comparable. However, designing a single price index for health care services is difficult because the tracking and billing of health care services differ across health care settings and service providers. For the HMI, two price indices are calculated: one for inpatient services and one for outpatient services.[10] We treat inpatient and outpatient services as different goods because even seemingly similar inpatient and outpatient services are rarely direct substitutes for each other, may face differing economic environments, and because services are coded and reimbursed for differently across these two settings. Most inpatient services are reimbursed with a single payment for a particular set of diagnoses, procedures, and services known as Diagnosis-Related Groups (DRGs). DRGs are defined by the Centers for Medicare & Medicaid Services (CMS) for determining Medicare inpatient hospital reimbursement rates but are also commonly used by private insurers for inpatient reimbursement. Outpatient services are generally reimbursed on a fee-for-service basis with a negotiated payment rate for each procedure performed. Therefore, aligning prices across the inpatient and outpatient settings for the same procedures or even bundles of services is difficult.

The price indices are based on the most common DRG codes in the inpatient setting and most common Current Procedural Terminology or Health Care Common Procedure Coding System (CPT/HCPCS) codes in the outpatient setting. The count of codes was limited to the full analysis cohort in the 41 CBSAs included in the HMI analyses. The inpatient market basket of services included the 100 most commonly occurring DRGs on the basis of the number of admissions for each DRG in the year 2012. No separately billed non-facility (i.e., professional services) claims are included in the inpatient price index. The 500 most common CPT codes from 2012 claims comprise the outpatient market basket. [11]

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[10] Physician services were not included in this HMI measure but prices and characteristics of these markets may also differ from both inpatient and outpatient markets and within the physician market by specialty and practice affiliations.

[11] The price index methodology is based on, but not identical to, an approach developed by Harvard University as part of an Institute of Medicine–sponsored study of geographic variation in health care expenditures and utilization. IOM (Institute of Medicine). 2013. *Variation in health care spending: Target decision making, not geography.* Washington, DC: The National Academies Press.

Although the price index is composed of only a fraction of billing codes that occur in the claims data (approximately 13 percent of DRGs and 6 percent of CPTs), they represent the greater part of spending. In each year of analysis, the 100 DRGs included in the inpatient price index accounted for approximately 63 percent of inpatient spending, and the 500 CPTs accounted for more than 75 percent of outpatient spending. For each set of codes (DRGs or CPTs) in the respective market baskets, a weight was calculated from the non-zero, non-negative dollar 2012 claims. Using the full analysis cohort, the number of observations of a particular code was divided by the total number of codes observed in the market basket to create a DRG specific weight.[12] The weight calculation for the inpatient price index can be expressed as

$$\boldsymbol{DRG\ weight_i = DRG\ Count_i / \sum_{i=1}^{100} (DRG\ Count_i)},$$

where *DRG Count*$_i$ is the number of times DRG code *i* is observed in the full analysis cohort.

Annual weighted average prices were calculated using the 2012 market basket weights to allow for comparison of indices over time. For each CBSA and for the full analysis cohort in a given year, the mean price of each code is multiplied by its respective weight. The weighted mean prices are summed to produce a weighted mean market basket price for each CBSA and the full cohort in each year.[13] For year *t*, the inpatient weighted mean market basket inpatient price calculation for CBSA *m* is expressed

$$\boldsymbol{Market\ basket\ price_{mt} = \sum_{i=1}^{100} (Mean\ DRG\ price_{imt} * DRG\ weight_i)}.$$

All the CBSA weighted mean market basket prices in a given year are divided by the full cohort weighted mean market basket price from the same year to create CBSA index values. The inpatient price index calculation is expressed

$$\boldsymbol{Inpatient\ price\ index_{mt} = Market\ basket\ price_{mt} / Market\ basket\ price_{full\ cohortt}}.$$

The full analysis cohort weighted mean market basket price serves as a baseline for comparing the price levels across markets. An index value equal to 1.00 indicates that, on average, the price level in the CBSA was equal to the price level of the full analysis cohort for the same service mix. CBSAs with higher than average prices will have index values larger than 1.00, and CBSAs with lower than average prices will have index values less than 1.00. These indices can be interpreted as a measure of the percentage difference in average

[12] This weight is specific the HMI analysis and is not related to the DRG case weights used for inpatient hospital Medicare reimbursement.

[13] Not all codes are observed in every CBSA. In such instances, the full analysis cohort mean price of that code is used in place of a CBSA mean price. The impact of this imputation minimizes variation across CBSAs by bringing the CBSA-level estimate closer to full cohort average.

prices in a CBSA relative to the full analysis cohort. For example, a value of 1.20 indicates that the price level for the HMI market basket is 20 percent higher in a given CBSA than for the full analysis cohort.

Confidence intervals for the price indices are calculated using a simulation methodology. A random sample of claims equal to the size of the full analysis cohort is randomly drawn with replacement from the full analysis cohort claims data. Index values for each CBSA are calculated as described earlier with the random sample data set. This process is repeated 500 times for the inpatient price index and 100 times for the outpatient price index.[14] The fifth and ninety-fifth percentiles of the resulting set of index values are reported as confidence intervals.

Productivity

The HMI productivity metrics include multiple measures of health care service use and CBSA-level health. The metrics are designed to allow easy comparisons of inputs in the production of health (i.e., health care services) to various measures of output (i.e., health). The metrics can be used to identify correlations and patterns in health relative to the services provided. The measures are reported to allow researchers and health policy leaders to recognize potential relationships between utilization, health, and prices so that areas for additional detailed investigations can be identified. The HMI metrics do not specify a health production function or attempt to measure the amount of health resulting from particular combinations of inputs. In other words, these measures do not directly measure productivity by defining causal relationships, such as X type of service results in Y percent better health or health outcomes.

Measuring productivity from an economic standpoint is a challenging task in most industries. It is especially difficult in health care due to agency, measurement, and endogeneity issues, among others. For example, health is the product of interest, but health is a combination of individual behavior and choices, provider decisions and treatment effectiveness, and access and utilization that may be influenced by an individual's insurance plan. Additionally, measuring health and attributing changes in health to particular treatments or behaviors is not trivial. [15]

Utilization index

The HMI utilization index holds the prices of services fixed, but the amount of services may vary between CBSAs. Therefore, differences in the utilization index value can be attributed to the mix of services rather than the price. An index value of 1.00 indicates that the cost of the CBSA-level service mix is equivalent to the full analysis cohort service mix cost. In CBSAs where more high priced

[14] The outpatient claims data file was substantially larger than the inpatient file, resulting in significantly more processing time for any given calculation.

[15] In an ideal economic setting, individuals' health may be expressed as a function of labor (e.g., health care services received) and capital (e.g., current health status). However, the functional relationship of these health inputs likely differs widely by individual. For example, diet, exercise, and genetics would affect how health care use given a current health status affects future health. Because of the complex nature of health production, deriving a valid health production function is an extremely difficult exercise and beyond the scope of the HMI.

services are used, the index value will be greater than 1.00. In CBSAs where fewer high priced services are used, relative to the total population, the index value will be less than 1.00.

Similar to the price index, a utilization index was developed for the HMI; it allows for easy and appropriate comparisons of health care service use across markets or within a single market over time. The utilization index is constructed from the same services as the price index but the price of each service is held constant across markets. The utilization index allows the mix of services to vary. The metric, therefore, can be used to assess differences in amounts of services used within a CBSA.

The construction of the utilization index is similar to that of the price index; however, in the utilization index calculation, the proportion of services is allowed to vary by CBSA while the mean price is held constant. Thus, the prices serve as "weights" whereby services with higher average prices contribute more to the weighted mean price, all else equal. The same 2012 inpatient and outpatient market baskets of DRG and CPT codes used for the price index calculations are used to calculate the utilization index.

Weights for the utilization index calculation are calculated in the same way as for the price index, but a weight is calculated for each CBSA and the full analysis cohort for all years. The inpatient utilization index weight for CBSA *m* in year *t* is expressed as

$$\boldsymbol{DRG\ weight_{imt}} = \boldsymbol{DRG\ count_{imt}} / \sum_{i=1}^{100} (\boldsymbol{DRG\ count_{imt}}),$$

where *DRG Count*$_i$ is the number of times DRG code *i* is observed in CBSA *m* in year *t*. If a DRG or CPT code is not observed in a CBSA in a given year, the weight equals zero.

The mean price is again calculated for each code from the non-zero, non-negative dollar 2012 claims from the full analysis cohort. However, only one price is calculated for each code from the full analysis cohort, rather than CBSA-level specific mean prices as in the price index. The mean price for each code was multiplied by its respective weight in the CBSA and year to obtain a weighted mean price, which was summed to produce a weighted mean market basket price. The inpatient weighted mean price calculation for CBSA *m* in year *t* can be written as

$$\boldsymbol{Market\ basket\ price_{mt}} = \sum_{i=1}^{100} (\boldsymbol{Mean\ DRG\ price_i} * \boldsymbol{DRG\ weight_{imt}}).$$

The utilization index values for each year were calculated by dividing each CBSA weighted mean market basket price by the full cohort weighted mean market basket price:

$$\boldsymbol{Inpatient\ utilization\ index_{mt}} = \boldsymbol{Market\ basket\ price_{mt}} / \boldsymbol{Market\ basket\ price_{full\ cohortt}}.$$

As with the price index, 1.00 is the baseline index value for a mix of services equivalent to the full analysis cohort. The utilization index can also be interpreted as the percentage difference of a CBSA utilization from the full analysis cohort, so as CBSA with a utilization index of 1.2 has utilization that is 20 percent higher than average, or more precisely, has utilization which at average prices would lead to expenditures which were 20 percent higher. Confidence intervals for the use indices are calculated using the same simulation approach described earlier for the price index.

CBSA population health

CBSA-level population health measures were constructed by averaging the RWJF County Health Rankings measures of mortality and morbidity. Higher values of the CBSA-level health measures are associated with worse population health for both types of measures.

Comparing health to the health care resource use is not a true measure of productivity, but the comparison does permit the identification of patterns, which may isolate areas for more detailed research. Specifically, use patterns in areas with poorer health may be of interest to policy makers, researchers, and health care leaders. If health care service use is relatively high and health is relatively poor, health care may be ineffective (i.e., even though many services are being provided, health is still poor). Alternatively, if use is relatively low and health is relatively poor, it may indicate that necessary and essential health care services are not available or are not being provided.

CBSA-level health outcomes measures for comparison to the utilization indices were developed from the RWJF County Health Rankings and Roadmaps project.[16] The CBSA-level measures were constructed by averaging the county level measures weighted by ACS county-level 18- through 64-year-old ESI population estimates. Two types of health measures were included in the HMI: (1) mortality measured by number of deaths younger than age 75 and years of potential life lost (age-adjusted rate per 100,000) and (2) morbidity measured by the percent of adults that report fair or poor health (age-adjusted).[17] Higher values are associated with worse population health for both types of measures.

The RWJF reported health measures are feasible and adequate comparators for the utilization index because they are reported at a population level for comparable geographies; and measures of mortality (potential life years lost) and morbidity (poor or fair health days) are likely related to inpatient and outpatient facility services use. However, there are limitations to the health measures in the context of the HMI. First, the measures are based on the entire county population rather than only the adult ESI population included in the HMI. The distribution of non-ESI populations (e.g., Medicare, Medicaid, uninsured) may differ by county and have differing impacts on the health measures. Second, the health measures are based on an aggregation of lagged survey data. For example, the 2013 health measures are based on data collected from surveys conducted over the years 2006 through 2011. For the HMI, the 2011 and 2012 use indices are compared to the health measures published by the Robert Wood Johnson Foundation (RWJF) in 2013 and 2015 so that the final survey year of data is consistent with the claims data. The use index–health measure comparisons offer

[16] Robert Wood Johnson Foundation, County Health Ranking and Roadmaps. Available at: http://www.countyhealthrankings.org/.
[17] Robert Wood Johnson Foundation, County Health Ranking and Roadmaps. Available at: http://www.countyhealthrankings.org/.

insights into possible relationships between resource use and health but are not evidence of determinate or causal relationships.

Health and resource use

For the HMI (and potentially in other settings), the simplicity of a single value relating health to resource use is appealing for reporting and for ease of comparison. Individual health and resource use indices are also potentially valuable. Therefore, a measure combining separate health and resource use indices—the health-resource use ratio (HRUR)—was developed for the HMI. The HRUR was based on methodology designed to capitalize on the information available in claims data, which was appealing for the HMI. [18] Consistency of comparisons in the HRUR measures was attained by using professional services claims (e.g., non-facility claims from physicians) to calculate both the resource use and health indices. Because professional services claims are included for much, if not all, of an individual's health care utilization, the professional claims provide a broad and reliable source for measuring health. These claims are also a dependable source of data for measuring resource intensity.

Both the resource use and health indices are calculated from physician claims; however, the complete physician claims file for the full analysis cohort was too large to feasibly perform calculations across all individuals in a suitable time frame.[19] A 50 percent random sample of the full analysis cohort was drawn to use for the health and resource use index calculations. The membership characteristics of the sample analysis cohort were distributed similarly to the full analysis cohort population. A comparison of descriptive characteristics of is shown in Table 4. Approximately 38 percent of the sampled population per year had professional services claims resulting in sufficient sample sizes for performing calculations at the CBSA level.

[18] The basis of the HRUR is the Medical Productivity Index, which combines measures of health status and medical resource to monitor a medical input-output ratio. The underlying assumption of the MPI was that health care use (i.e., input) contributes to the production of health (i.e., output). Parente S. (2011). "Development of a Medical Productivity Index for health insurance beneficiaries" *Insurance Markets and Companies: Analyses and Actuarial Computations*, 2 (2), pp. 7-15.

[19] The 50% file was over 50 GB in size and required substantial time to load and run through the statistical software.

Table 4. Summary of member characteristics of the full and sample analysis cohorts

	2011		2012		2013	
	Full cohort	Sample	Full cohort	Sample	Full cohort	Sample
N	13,371,314	6,686,485	13,254,676	6,628,031	13,289,770	6,645,523
Percent male	47.82%	47.81%	48.07%	48.06%	48.20%	48.20%
Ages 18 through 24	15.89%	15.89%	16.29%	16.31%	16.43%	16.45%
Ages 25 through 34	21.13%	21.13%	21.39%	21.38%	21.69%	21.68%
Ages 35 through 44	22.52%	22.54%	22.19%	22.19%	21.98%	21.97%
Ages 45 through 54	23.26%	23.27%	22.86%	22.87%	22.50%	22.50%
Ages 55 through 64	17.19%	17.18%	17.26%	17.26%	17.41%	17.40%
Average membership months	9.80	9.80	9.84	9.84	9.77	9.77

Source: HCCI, 2015.

Resource use index

The resource use index is a CBSA-level average of a measure of professional services intensity. A CBSA with an index value of 1.00 has a resource use level equivalent to the full analysis cohort. A value larger than 1.00 implies higher relative resource use, and a value less than 1.00 implies lower relative resource use.

Resource use was operationalized as the sum of CPT codes across all health care settings weighted by the Resource-Based Relative Value Scale (RBRVS) for each code. CMS uses the RBRVS to assign measures of physician effort to all CPT codes and adjusts the weights annually. Total resource use, *R*, for individual *i* in period *t*, is expressed

$$\boldsymbol{R_{it} = \sum_k (RVBVS_{kt} * CPT_{kit})},$$

where *k* is the number of CPT codes in period *t* for person *i*. CPT_{kit} is an indicator equal to 1 if CPT code *k* is observed in the claims for person *i* in period *t* and 0 otherwise. Larger values of *R* imply more medical resources used.

A value of *R* is calculated for quarterly observation periods within a year. If no claims occur in a quarter, no resource use measure appears. Thus, an individual with physician claims will have 1 to 4 observations per a year. For the HMI, individuals' quarterly measures are averaged within a year, producing a single resource use measure per person per year. Averaging quarterly measures minimizes the impact of high–resource-use encounters and provides a measure of typical use rather than total use. The individual annual average resource use measures are weighted by individuals' months of enrollment and averaged over the full analysis cohort and within each CBSA. For example, if an individual were a member for 12 months of 1,200 total months in a CBSA, the weight applied to his or her resource use measure would be 12/1,200 = .001. This weighted average minimizes the impact of members who have minimal coverage but may not be representative of the long-term population. The CBSA resource measure calculation is computed as follows:

$$\boldsymbol{Resource\ use\ measure_{mt} = \sum_i \left(\frac{n_{imt}}{\sum_i n_{imt}} * \overline{R_{imt}}\right)},$$

where n_{imt} is individual *i*'s months of coverage in CBSA *m*, in year *t*, and $\overline{R_{imt}}$ is individual *i*'s average annual resource use measures in CBSA *m* in year *t*. The resource use index was constructed by dividing the CBSA resource use measures for a given year by the full analysis cohort measure for that year:

$$\textit{Resource use index}_{mt} = \textit{Resource use measure}_{mt} / \textit{Resource use measure}_{\textit{full cohort } t}.$$

The index can be interpreted as all of the indices previously described; a measure of 1.00 is the average resource use for the full analysis cohort. A value larger than 1.00 implies higher relative resource use, and a value less than 1.00 implies lower relative resource use.

Health index

The health index is a CBSA-level average of a measure of illness. A CBSA with an index value of 1.00 has an illness level equivalent to the total population. A value larger than 1.00 implies higher relative illness level, and a value less than 1.00 implies better health.

Health was operationalized as a measure of illness level on the basis of diagnosis codes observed in the physician claims. The 34 Adjusted Diagnostic Groups (ADGs) as defined by the Johns Hopkins Adjusted Clinical Group system are the basis for measuring illness. An indicator for each of the 34 ADGs is recorded as 1, if a condition is present in the observation period, and 0 otherwise. Even in multiple instances of claims meeting the ADG criteria within the observation period, the indicator takes only a value of 1 or 0. These indicators were assigned weights derived for commercially insured population in previous research.[20]

For an individual, *i*, the weighted ADG count is summed over the observation period *t* in a manner similar to the calculation of the resource use measure

$$H_{it} = \sum_{34}(\textit{ADG weight}_{lt} * ADG_{lit}),$$

where ADG_{lit} is an indicator equal to 1 if ADG code *l* is observed in the claims for person *i* in period *t* and 0 otherwise. Larger values of *H* imply poorer health.

Also, like the resource use measure, health measures were calculated for each CBSA and the full analysis cohort as the member month weighted average of the individual quarterly measures averaged over a year. The CBSA-level health measure calculation is

$$\textit{Health measure}_{mt} = \sum_i \left(\frac{n_{imt}}{\sum_i n_{imt}} * \overline{H_{imt}}\right),$$

where n_{imt} is individual *i*'s months of coverage in CBSA *m*, in year *t*, and $\overline{H_{imt}}$ is individual *i*'s average annual health measures in CBSA *m* in year *t*.

[20] Parente, S. T., Feldman, R., Christianson, J. B.(2004) "Evaluation of the Effect of A Consumer-Driven Health Plan on Medical Care Expenditures, Health Services Research 39(4) Part II.

The health index was constructed by dividing the CBSA health measures for a given year by the full analysis cohort health measure for that year:

$$\boldsymbol{Health\ index_{mt} = Health\ measure_{mt}/Health\ measure_{full\ cohort\ t}}.$$

A health index value of 1.00 implies the average health in a CBSA is equivalent to the average health of the full analysis cohort. Because the health measure actually measures illness burden, index values greater than 1.00 indicate poorer relative health in a CBSA as compared to the full analysis cohort, and better relative health is conveyed by values less than 1.00.

Health - resource use ratio (HRUR)

The HRUR measure compares the CBSA-level resource use index to the health index. An HRUR value of 1.00 implies that the level of resource use in a CBSA relative to the total population is proportionally the same as the level of health relative to the total population. A value other than 1.00 implies that the percentage that a CBSA's resource use differs from the total population resource use is different than the percentage that the CBSA-level health measure differs from the total population health measure.

The HRUR is expressed as a ratio of the resource use index to the health index:

$$\boldsymbol{HRUR_{mt} = (Resource\ use\ index_{mt})/(Health\ index_{mt})}.$$

The interpretation of the HRUR is similar to all the other indices in the HMI. The ratio measures compares relative resource use to relative health for a CBSA. An HRUR measure of 1.00 implies that the level of resource use in a CBSA relative to the full cohort is proportionally the same as the level of health relative to the full cohort. For example, a resource use index of 1.05 and a health index of 1.05 would produce an HRUR of 1.00. In this example, the CBSA had 5 percent more resource use and 5 percent worse health than the full analysis cohort.[21] A challenge with interpreting any ratio is that one does not know, for example, whether the HRUR is less than 1.00 because of a smaller numerator (lower relative resource use) or a larger denominator (worse relative health). Therefore, the resource use index, health index, and HRUR are all reported as part of the HMI.

The HRUR cannot be interpreted as the level of health that results from a particular amount of resource use. Rather, the HRUR is provided as another descriptive measure that combines the measures of health and resources use into a single metric for comparison over time and across geographies. For example, an HRUR that switches from less than 1.00 to greater than 1.00 over some period of time could indicate excess growth in resource use relative to health and may warrant examination by researchers or policy makers. For example, examination of the resource use and health indices could be used to identify which area to prioritize.

[21] This measure treats both the numerator and denominator as exogenous. In other words, the HRUR does not make any assumptions regarding causality between resource use and health. It is merely a descriptive measure.

Competition

A large literature discusses the role of competition on price and quality in health care markets.[22] Much of the economic literature in that area involves sophisticated econometric modeling and/or requires the collection and analysis of more detailed market characteristics than the HMI could feasibly conduct in a national survey. Within the confines of the resources available for the HMI, however, providing an assessment of the concentration of providers and use of inpatient hospitals by CBSA was possible. The HMI focuses on hospital inpatient facilities due to feasibility (i.e., data availability and scope) and the growing relevance of hospital markets (e.g., rising hospital prices, increased hospital consolidation, and hospital acquisitions of physician groups).

The inpatient hospital services concentration measures allow stakeholder to assess two important aspects of hospital markets. The first measure, in-CBSA admission share, provides relevant information for understanding how the health care infrastructure in a CBSA is used. The second measure, the Herfindahl-Hirschman Index (HHI), presents a view of how inpatient admissions for residents of a CBSA are distributed. Given the scope of the HMI, we believe this approach to reporting on competition was the most feasible for reporting purposes and will provide stakeholders with a reasonable assessment of hospital concentration that can inform policy and more specific research.

Both HMI concentration measures are calculated using inpatient claims from the full analysis cohort. The inpatient claims for these individuals were matched by National Provider ID to the 2012 and 2013 Annual Survey Database produced by the American Hospital Association (AHA).[23] Inpatient claims for the concentration analysis were limited to non-federal, non-military, general acute care (GAC) hospitals in the AHA data. CBSA-level shares of hospital admissions were calculated using all admissions for individuals residing within a CBSA. Individuals with admissions to any hospital located outside the CBSA were aggregated into a single share for "non-CBSA hospital" admissions. Thus, the HHI calculation was the sum of hospitals' squared CBSA-level shares plus the squared non-CBSA hospital share.

The HMI competition measures are potentially relevant to health care leaders and policy makers as well as researchers for two reasons: 1) competition for privately insured patients, in part, determines privately insured prices; and 2) privately insured patients may have hospital preferences that differ from preferences

[22] See Gaynor, M. and Town R., "Competition in Health Care Markets," *Handbook of Health Economics, vol. 2* Ed. Pauly, MV, Mcguire, TG, and Barros, PP. Waltham, MA North Holland 2012 pages: 499–637 for a thorough discussion of the existing literature.

[23] The AHA Annual Survey Database is a census of United States hospitals based on the AHA Annual Survey of Hospitals. The AHA data includes information on more than 6,200 hospitals, with nearly 1,000 variables. The survey data are supplemented with data from secondary sources including the United States Census Bureau, and accrediting organizations. HCCI has licensed the AHA annual survey data for 2012 and 2013, restricting the competition metrics to those years.

observed when HHIs include all admissions. However, neither of the HMI concentration analyses should be considered a comprehensive competition analysis.[24]

In-CBSA admissions

The In-CBSA admissions metric measures the percentage of individuals with inpatient admissions admitted to a hospital in their CBSA. A higher percentage implies more individuals were admitted to hospitals within the CBSA they reside in.

The first HMI concentration measure is the percentage of individuals with inpatient admissions admitted to a hospital in their CBSA. Because CBSAs are defined on the basis of commuting areas, many patients were assumed to be admitted to hospitals within the same area in which they live and commute to work. However, smaller CBSAs, CBSAs located not too far from other CBSAs, or CBSAs with a highly concentrated hospital industry may have fewer choices, and patients may choose hospitals outside their CBSA. There may also be hospitals outside a patients' CBSAs, which patients prefer for the technology, amenities, etc. offered by the hospitals.

CBSA-level Herfindahl-Hirschman Index

The CBSA-level HHI is a measure of hospital concentration. A higher hospital concentration implies more admissions occur at fewer hospitals.

The HHI is a commonly used measure of market concentration and is used in many settings, not just in health care markets.[25] An HHI is calculated by summing the squared shares over all competitors in a market. The HHI is commonly multiplied by 10,000 for reporting purposes. A maximum HHI measure of 10,000 would occur in a monopolistic market where a single firm had a 100 percent market share. Smaller HHI values indicate fewer concentrated markets. For example, if 10 hospitals each have 10 percent share of the admissions in a market, the HHI would be 1,000.

Results

Price

Price index

The HMI price indices can be used to determine whether price levels changed over time within one CBSA or how health care prices in one CBSA compare to prices in another CBSA.[26] These types of assessments may be

[24] The HMI results alone are not suitable for regulatory or antitrust enforcement purposes. HCCI data comprise only a sample of any hospital's total admissions. Even in areas where HCCI data account for a large share of the ESI claims, hospitals admissions include patients with individual (i.e., non-ESI) insurance, Medicare, Medicaid, Medicare Advantage, and so on and the uninsured. Additionally, the HMI measures have been calculated for geographies that were chosen on the basis of relevance to a broad spectrum of research and policy evaluations. These geographies are not necessarily the appropriate market definitions for evaluating hospital competition for regulatory or legal investigations.

[25] See http://www.justice.gov/atr/herfindahl-hirschman-index for a more detailed description.

[26] The index value is calculated as the weighted mean market basket CBSA-level price divided by the weighted mean market basket price for the full analysis cohort.

of particular interest given that total health care expenditures are a growing share of the U.S. GDP, and health care expenditure growth is due in large part to increases in prices.[27] An index value greater than 1.00 indicates that the price level in a given CBSA was higher than the price level of the full analysis cohort for the same service mix. If a CBSA price level was low relative to the full cohort price level, the index value was less than 1.00.

Generally, the distribution of inpatient and outpatient index values was consistent over time, suggesting the absence of industry-wide changes in prices overtime. Summary statistics for the 2011 through 2013 inpatient and outpatient price index estimates are presented in Table 5. The average inpatient index value was 1.00 in all 3 years, and the average outpatient index value is 1.02 in all years. Similar magnitude and consistency occurred over time in the median index values. Some fluctuations were seen in the minimum and maximum values of both indices over time, but measures of variation and dispersion of the index values are consistent over time. For example, the standard deviation and the coefficient of variation (the standard deviation divided by the mean) were also consistent for both sets of index values. This suggests that, over time, the index value distributions remained constant.

Table 5. Price indices summary statistics

	Inpatient			Outpatient		
	2011	2012	2013	2011	2012	2013
Mean (Standard deviation)	1.00 (0.15)	1.00 (0.15)	1.00 (0.15)	1.02 (0.14)	1.02 (0.13)	1.02 (0.13)
Minimum	0.73	0.72	0.72	0.66	0.69	0.71
25th percentile	0.90	0.92	0.91	0.97	0.95	0.95
50th percentile	0.99	1.00	1.00	1.02	1.01	1.02
75th percentile	1.08	1.08	1.09	1.08	1.09	1.09
Maximum	1.43	1.50	1.47	1.38	1.30	1.31

Source: HCCI, 2015.

The price indices were also consistent over time within CBSAs, suggesting that over the period 2011 to 2013, prices within a geography remained constant relative to the full analysis cohort and other geographies. In other words, areas with prices higher than the full cohort average (i.e., index > 1.00) remained high and vice versa. The correlations of the inpatient and outpatient indices over time and the correlation between inpatient and outpatient indices within the same year are shown in Table 6.[28]

[27] For examples of rising price trends see Health Care Cost Institute. 2013 Health Care Cost and Utilization Report. HCCI, Oct. 2014. Web. For a recent discussion of the GDP share of health care GDP Hartman, M. et al., "National Health Spending in 2013: Growth Slows, Remains In Step With Overall Economy." *Health Affairs* 2015;34(1):150-160.
[28] In the text, "correlation" refers to the common "Pearson correlation coefficient"; when other correlation coefficients are reported, they are explicitly noted.

Table 6. Correlations of price indices across years and indices

Cross year correlations	2011-2012	2012-2013	2011-2013
Inpatient price	0.986***	0.994***	0.983***
Outpatient price	0.983***	0.976***	0.940***
Within year correlations	**2011**	**2012**	**2013**
Inpatient to outpatient price	0.588***	0.597***	0.532***

Source: HCCI, 2015.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.

The correlation coefficients of 0.532 to 0.597, shown in Table 6, support the assertion that there may be differences in market dynamics by service location—inpatient versus outpatient. If price levels for inpatient and outpatient services were determined in the same markets, the correlations coefficients would likely be larger. The positive and statistically significant correlation coefficients do suggest the prices levels of inpatient and outpatient services tend to move in the same direction but, in some instances, the inpatient and outpatient price indices diverge.

The CBSA-level inpatient and outpatient price indices for all 3 years are displayed in Table 7. For example, Orlando had a relatively high inpatient indices (1.19–1.25) and low outpatient indices (0.90–0.95). Alternatively, Houston and Corpus Christi had average (0.97–1.00) and relatively low inpatient indices (0.82–0.85), respectively, but both CBSAs had relatively high outpatient index values (1.21–1.23 and 1.07–1.09, respectively).

Although the inpatient and outpatient markets and price levels could differ within a CBSA, some CBSA indices exhibited similar patterns in prices over time. For example, Boulder, Bridgeport, and Fort Collins had among the highest inpatient and outpatient index values in all 3 years. The average inpatient price index of those CBSAs over the entire study period was 1.29, and the average outpatient price index was 1.20. Alternatively, St. Louis and Tucson had the lowest index values for both inpatient and outpatient prices in all years, with an average inpatient price index of 0.75 and an average outpatient index of 0.72. Table A2 through Table A7 present the confidence intervals by year for both indices index.

Table 7. Inpatient and outpatient price indices by year

CBSA Name	Inpatient			Outpatient		
	2011	2012	2013	2011	2012	2013
Atlanta-Sandy Springs-Roswell, GA	0.90	0.92	0.93	0.97	0.99	1.01
Augusta-Richmond County, GA-SC	0.94	0.94	0.94	0.97	0.95	0.94
Austin-Round Rock, TX	0.99	1.01	1.02	1.02	1.03	1.07
Beaumont-Port Arthur, TX	0.95	1.00	1.00	1.08	1.08	1.09
Boulder, CO	1.20	1.20	1.17	1.13	1.12	1.12
Bridgeport-Stamford-Norwalk, CT	1.25	1.23	1.21	1.20	1.16	1.12
Cape Coral-Fort Myers, FL	1.06	1.03	1.01	1.02	1.04	1.05
Cincinnati, OH-KY-IN	0.97	0.99	1.00	0.90	0.89	0.89
Colorado Springs, CO	1.01	1.05	1.02	1.02	1.05	1.04
Columbus, OH	1.04	1.03	1.03	1.04	1.05	1.06
Corpus Christi, TX	0.85	0.82	0.82	1.07	1.09	1.08
Dallas-Fort Worth-Arlington, TX	1.14	1.12	1.13	1.09	1.10	1.14
Dayton, OH	1.19	1.16	1.18	1.03	1.02	0.96
Denver-Aurora-Lakewood, CO	1.06	1.04	1.05	1.24	1.22	1.23
El Paso, TX	1.16	1.17	1.16	1.22	1.22	1.19
Fort Collins, CO	1.43	1.50	1.47	1.38	1.30	1.27
Green Bay, WI	0.94	0.94	0.96	1.08	1.08	1.11
Greensboro-High Point, NC	1.08	1.07	1.07	0.95	0.97	1.03
Houston-The Woodlands-Sugar Land, TX	1.00	1.00	0.97	1.21	1.23	1.21
Jacksonville, FL	1.06	1.08	1.10	0.88	0.89	0.87
Kansas City, MO-KS	0.89	0.89	0.88	0.99	0.95	0.94
Lakeland-Winter Haven, FL	0.95	0.94	0.93	1.09	1.11	1.13
Lexington-Fayette, KY	0.84	0.82	0.83	0.97	0.95	0.95
Louisville/Jefferson County, KY-IN	0.76	0.76	0.76	0.87	0.85	0.82
Miami-Fort Lauderdale-West Palm Beach, FL	0.95	0.94	0.92	1.05	1.06	1.08
Milwaukee-Waukesha-West Allis, WI	1.09	1.09	1.09	1.04	1.08	1.07
New Orleans-Metairie, LA	0.87	0.81	0.81	0.82	0.81	0.76
North Port-Sarasota-Bradenton, FL	0.93	0.93	0.92	0.99	0.97	0.96
Omaha-Council Bluffs, NE-IA	1.00	0.98	1.02	1.02	1.01	1.02
Orlando-Kissimmee-Sanford, FL	1.19	1.22	1.25	0.90	0.94	0.95
Palm Bay-Melbourne-Titusville, FL	1.15	1.15	1.12	1.01	0.99	1.01
Peoria, IL	0.77	0.82	0.80	0.98	0.91	0.83
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.17	1.16	1.18	1.12	1.09	1.06
Phoenix-Mesa-Scottsdale, AZ	1.00	1.00	1.00	0.93	0.93	0.97
St. Louis, MO-IL	0.78	0.77	0.79	0.75	0.76	0.77
San Antonio-New Braunfels, TX	0.87	0.86	0.86	0.99	0.97	1.00
Tampa-St. Petersburg-Clearwater, FL	0.99	1.04	1.05	0.97	0.98	1.00
Trenton, NJ	0.92	0.94	0.91	1.30	1.30	1.31
Tucson, AZ	0.73	0.72	0.72	0.66	0.69	0.71
Tulsa, OK	0.82	0.81	0.82	1.01	0.99	0.99
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.00	0.98	0.98	0.94	0.92	0.88

Source: HCCI, 2015.

Input–adjusted price index

The two price indices hold the mix of services constant over time and across CBSAs, so changes in the price index values can be attributed to changes in prices rather than in services. However, the prices of services are influenced by the price of the inputs needed to provide services (e.g., labor, medical supplies, rent). For example, the overall cost of living is higher in New York than in Kansas, and wages for hospital or clinic staff or costs of supplies is likely higher in New York.[29]

A second set of price indices adjusted for the cost of inputs was also calculated. The input–adjusted price indices provide measures of relative price levels with labor costs held constant across all CBSAs.[30] The input–adjusted price indices use the same index calculation methodology, but inpatient and outpatient prices were multiplied by a CBSA-level input price adjustment factor. For each CBSA, the annual CMS hospital wage index was used to create a weighting factor based on average hourly wages.[31] Each claim line used in the original price index calculation was multiplied by the respective adjustment factor, and the price indices were recalculated (as described in Methodology). CBSAs with higher input prices had adjustment factors less than 1.00. Alternatively, inpatient and outpatient prices in areas with lower input prices were adjusted up by adjustment factors over 1.00.

The distributions of input–adjusted price indices by year are presented in Table 8. The index distributions are similar across years. The results are also similar to the unadjusted price index distributions reported in Table 5. Both the input price–adjusted index standard deviations and coefficients of variation are comparable to the respective unadjusted statistics. The average and median of the input–adjusted outpatient price indices, however, are slightly larger than the averages and medians of the unadjusted indices. The input–adjusted inpatient price index average was also larger than the unadjusted average. Conversely, the input–adjusted inpatient price medians were slightly lower than the unadjusted price index medians.

[29] For example, according to some calculations, $100 dollars is worth $110 in KS and $87 in NY (http://www.washingtonpost.com/blogs/govbeat/wp/2015/07/08/map-how-much-100-is-really-worth-in-every-state-2/).
[30] A similar approach was used by the Government Accountability Office (GAO) to examine health care prices in the Federal Employee Benefits program. GAO, Federal Employees Health Benefits Program: Competition and Other Factors Linked to Wide Variation in Health Care Prices, GAO-05-856 (Washington, D.C.: Aug. 15, 2005).
[31] CMS wage index files were matched to HMI analysis years by fiscal year. For example, data from the 2011 fiscal year wage index file were used to calculate the input adjustment factor for the 2011 HMI price indices. CMS data are available at: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Wage-Index-Files.html.

Table 8. Input–adjusted price indices summary statistics

	Inpatient			Outpatient		
	2011	2012	2013	2011	2012	2013
Mean (Standard deviation)	1.02 (0.15)	1.02 (0.15)	1.02 (0.15)	1.05 (0.14)	1.04 (0.14)	1.05 (0.14)
Minimum	0.73	0.74	0.76	0.66	0.70	0.75
25th percentile	0.93	0.92	0.90	0.99	0.97	0.96
50th percentile	0.98	0.97	0.99	1.04	1.05	1.05
75th percentile	1.09	1.11	1.11	1.11	1.09	1.15
Maximum	1.46	1.53	1.48	1.42	1.38	1.36

Source: HCCI, 2015 and FY 2011-2013 CMS wage index files.

Correlations of the input–adjusted price index values across years and correlations of the adjusted and unadjusted indices within years provide some additional insights into the impact of input costs on prices. The within-year correlation coefficients suggest that the input price adjustment has a marginal impact on relative price levels, but the general patterns observed among the unadjusted price indices are consistent. All the correlation coefficients are reported in Table 9.

The correlation coefficients between the input–adjusted price indices are similar in magnitude to the correlations of the unadjusted price indices reported in Table 6. A positively and statistically significant relationship also exists between the input price–adjusted indices and the unadjusted indices, ranging from 0.79 to 0.86. This implies that similar patterns of price levels across CBSAs resulted in the adjusted and unadjusted measures. Spearman's rank correlation coefficients are also reported in Table 9 for input–adjusted and unadjusted indices. The Spearman's rank correlation coefficients were similar in magnitude to the correlation coefficients and ranged from 0.77 to 0.83. This suggests the correlations are not strongly influenced by outliers and that the input–adjusted and unadjusted price indices contain similar information about the relationship between prices in CBSAs.[32]

Table 9. Correlations of input–adjusted price indices across years and indices and input-adjusted indices to unadjusted indices within years

Cross year correlations	2011-2012	2012-2013	2011-2013
Inpatient input adjusted index	0.978***	0.987***	0.972***
Outpatient input adjusted index	0.979***	0.966***	0.920***
Within year correlations	**2011**	**2012**	**2013**
Inpatient to outpatient input adjusted index	0.562***	0.572***	.524***
Inpatient input adjusted index to inpatient index	0.856***	0.863***	0.836***
Outpatient adjusted index to outpatient index	0.832***	0.814***	0.793***
Within year rank correlations	**2011**	**2012**	**2013**
Inpatient input adjusted index to inpatient index	0.824***	0.828***	0.798***
Outpatient input adjusted index to outpatient index	0.774***	0.784***	0.783***

Source: HCCI, 2015 and FY 2011-2013 CMS wage index files.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.

[32] Spearman's rank correlation assumes a monotonic relationship between the two variables of interest, but unlike Pearson's correlation the relationship may be non-linear.

The 2011–2013 input–adjusted inpatient and outpatient price indices by CBSA are presented in Table 10. Although the summary statistics and correlations imply that the overall patterns among the price indices remained the same after the input adjustment, differences in index magnitudes and rankings were observed. Among the CBSAs identified earlier as having relatively high inpatient and outpatient indices, Fort Collins also had relatively high input price–adjusted inpatient (1.46–1.53) and outpatient indices (1.28–1.42). Boulder still had index values greater than 1.00, but the magnitudes of the adjusted index values are lower (inpatient: 1.10–1.16; outpatient: 1.05–1.09). Moreover, both sets of index values in Bridgeport had lower magnitudes after the input price adjustment (inpatient: 0.88–0.96; outpatient: 0.82–0.93). Input–adjusted price indices remained low in St. Louis (inpatient: 0.82–0.84; outpatient: 0.80–0.82) and Tucson (inpatient: 0.73–0.76; outpatient: 0.66–0.75).

Price indices in some areas, however, increased after the input price adjustment. For example, inpatient and outpatient indices in El Paso and Greensboro were higher after the input adjustment. The 2012 input–adjusted price inpatient index in El Paso was 1.32 as compared to the unadjusted inpatient price index 1.17. In Greensboro, the unadjusted outpatient price index was 0.97 in 2012 while the input price–adjusted outpatient price index was 1.06. This suggests that relative to the full analysis cohort, prices in those areas are technically higher than observed because the cost to provide services is lower.

Table 10. Input–adjusted inpatient and outpatient price indices

CBSA Name	Inpatient			Outpatient		
	2011	2012	2013	2011	2012	2013
Atlanta-Sandy Springs-Roswell, GA	0.92	0.93	0.94	0.99	1.01	1.03
Augusta-Richmond County, GA-SC	0.96	0.96	0.99	0.99	0.96	0.98
Austin-Round Rock, TX	1.02	1.04	1.02	1.04	1.05	1.07
Beaumont-Port Arthur, TX	1.09	1.12	1.12	1.25	1.21	1.23
Boulder, CO	1.16	1.15	1.11	1.09	1.08	1.05
Bridgeport-Stamford-Norwalk, CT	0.96	0.92	0.88	0.93	0.87	0.82
Cape Coral-Fort Myers, FL	1.13	1.07	1.07	1.08	1.08	1.12
Cincinnati, OH-KY-IN	0.99	1.03	1.04	0.91	0.93	0.93
Colorado Springs, CO	1.07	1.06	1.05	1.08	1.07	1.07
Columbus, OH	1.00	1.00	1.02	1.00	1.02	1.06
Corpus Christi, TX	0.97	0.92	0.91	1.22	1.22	1.21
Dallas-Fort Worth-Arlington, TX	1.16	1.14	1.14	1.11	1.12	1.15
Dayton, OH	1.27	1.21	1.26	1.09	1.07	1.02
Denver-Aurora-Lakewood, CO	0.98	0.96	0.99	1.14	1.13	1.15
El Paso, TX	1.32	1.32	1.32	1.39	1.38	1.36
Fort Collins, CO	1.46	1.53	1.48	1.42	1.33	1.28
Green Bay, WI	0.97	0.95	0.96	1.12	1.09	1.12
Greensboro-High Point, NC	1.17	1.17	1.20	1.04	1.06	1.15
Houston-The Woodlands-Sugar Land, TX	0.98	0.97	0.94	1.19	1.19	1.18
Jacksonville, FL	1.16	1.18	1.19	0.96	0.97	0.95
Kansas City, MO-KS	0.90	0.91	0.90	1.01	0.97	0.97
Lakeland-Winter Haven, FL	1.07	1.07	1.08	1.24	1.25	1.31
Lexington-Fayette, KY	0.93	0.91	0.90	1.08	1.05	1.03
Louisville/Jefferson County, KY-IN	0.84	0.84	0.83	0.96	0.93	0.90
Miami-Fort Lauderdale-West Palm Beach, FL	0.92	0.92	0.89	1.03	1.04	1.05
Milwaukee-Waukesha-West Allis, WI	1.04	1.06	1.06	1.00	1.06	1.05
New Orleans-Metairie, LA	0.94	0.89	0.89	0.89	0.88	0.84
North Port-Sarasota-Bradenton, FL	0.97	0.98	0.97	1.04	1.03	1.01
Omaha-Council Bluffs, NE-IA	1.03	0.97	1.00	1.05	1.00	1.00
Orlando-Kissimmee-Sanford, FL	1.26	1.30	1.33	0.96	1.00	1.02
Palm Bay-Melbourne-Titusville, FL	1.20	1.23	1.22	1.06	1.06	1.10
Peoria, IL	0.81	0.89	0.87	1.03	0.99	0.91
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.07	1.07	1.07	1.03	1.00	0.96
Phoenix-Mesa-Scottsdale, AZ	0.93	0.93	0.93	0.86	0.87	0.90
St. Louis, MO-IL	0.84	0.82	0.82	0.81	0.82	0.80
San Antonio-New Braunfels, TX	0.93	0.93	0.93	1.07	1.04	1.09
Tampa-St. Petersburg-Clearwater, FL	1.07	1.11	1.13	1.04	1.05	1.08
Trenton, NJ	0.90	0.91	0.85	1.26	1.27	1.22
Tucson, AZ	0.73	0.74	0.76	0.66	0.70	0.75
Tulsa, OK	0.90	0.93	0.97	1.11	1.14	1.18
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.93	0.90	0.90	0.87	0.84	0.82

Source: HCCI, 2015 and FY 2011-2013 CMS wage index files.

Productivity

The HMI productivity measures provide data on components of health production. Specifically, the HMI includes measures of production inputs, health care services, and measures of output, health. The actual production process and multitude of factors affecting production (including other inputs and technology) were not included in the HMI. The intent of the HMI productivity measures was to provide a means of identifying the point at which more of the resources and processes underlying health production require more detailed investigations. The HMI includes two pairs of measures: 1) CBSA-level utilization indices compared with measures of population health and 2) individual-level health and resource indices calculated from claims data and aggregated to the CBSA level. The latter pair of measures were developed as inputs to the HRUR, which provides a single measure of health inputs relative to outputs based on information available in claims data.

Utilization index

Similar to the price indices, the distributions of utilization indices were consistent over the study period. Within each service-type index—inpatient and outpatient—the distributions are similar over time with nearly constant averages, medians, and standard deviations over all 3 years. Summary statistics for the 2011–2013 inpatient and outpatient utilization indices are presented in Table 11. The variance within the outpatient indices is greater than the variance observed in the inpatient index values. For example, the coefficient of variation and the interquartile range (the seventy-fifth percentile minus the twenty-fifth percentile) of the outpatient index is 2.5 to 3 times greater than the respective statistic from the inpatient use index in a given year.

Table 11. Utilization indices summary statistics

	Inpatient			Outpatient		
	2011	2012	2013	2011	2012	2013
Mean (Standard deviation)	1.02 (0.04)	1.02 (0.04)	1.02 (0.05)	0.98 (0.12)	0.99 (0.12)	0.99 (0.13)
Minimum	0.93	0.94	0.94	0.69	0.71	0.69
25th percentile	0.99	0.99	1.00	0.91	0.92	0.90
50th percentile	1.02	1.02	1.01	0.99	0.98	1.00
75th percentile	1.05	1.05	1.05	1.05	1.07	1.10
Maximum	1.11	1.14	1.16	1.23	1.21	1.19

Source: HCCI, 2015.

The correlation between the CBSA-level utilization indices over time and between inpatient and outpatient indices is shown in Table 12. Each service type index—inpatient and outpatient—is positively correlated over time. Unlike prices, however, inpatient and outpatient utilization are negatively correlated, although the correlation is only statistically significant in 2011.

Table 12. Correlations of utilization indices across years and indices

Cross year correlations	2011-2012	2012-2013	2011-2013
Inpatient utilization	0.915**	0.907**	0.902**
Outpatient utilization	0.962**	0.957**	0.900**
Within year correlations	**2011**	**2012**	**2013**
Inpatient to outpatient utilization	-0.275*	-0.179	-0.108

Source: HCCI, 2015.

*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.

Differences between inpatient and outpatient utilization index values were also observed in the CBSA-level estimates. Philadelphia had low inpatient use index values in all years (0.94–0.95) but higher outpatient use indices (1.13–1.18). San Antonio had average inpatient index values (1.01–1.02) and high outpatient utilization (1.19–1.21). Alternatively, Beaumont and Greensboro were examples of CBSAs with relatively higher inpatient indices (1.11–1.16 and 1.05–1.12, respectively) and low outpatient use indices (0.98–1.03 and 0.96–0.99, respectively). Utilization indices by year for each CBSA are presented in Table 13; the confidence intervals for the utilization indices are provided in Table A8 through Table A13.

Table 13. Inpatient and outpatient utilization indices by year

CBSA Name	Inpatient			Outpatient		
	2011	2012	2013	2011	2012	2013
Atlanta-Sandy Springs-Roswell, GA	1.01	1.00	1.01	1.15	1.18	1.14
Augusta-Richmond County, GA-SC	1.07	1.08	1.03	0.82	0.83	0.86
Austin-Round Rock, TX	0.97	0.96	0.98	1.10	1.10	1.13
Beaumont-Port Arthur, TX	1.11	1.14	1.16	0.98	1.01	1.03
Boulder, CO	1.01	1.02	1.01	1.06	1.13	1.13
Bridgeport-Stamford-Norwalk, CT	0.95	0.95	0.96	0.69	0.71	0.69
Cape Coral-Fort Myers, FL	1.05	1.07	1.05	0.94	0.92	0.89
Cincinnati, OH-KY-IN	1.04	1.03	1.03	0.99	1.01	1.02
Colorado Springs, CO	1.02	1.05	1.01	0.98	0.97	1.01
Columbus, OH	1.04	1.03	1.01	0.86	0.88	0.90
Corpus Christi, TX	1.05	1.05	1.08	1.04	1.08	1.18
Dallas-Fort Worth-Arlington, TX	1.01	1.01	1.00	0.97	0.97	0.97
Dayton, OH	1.05	1.04	1.04	0.92	0.94	0.93
Denver-Aurora-Lakewood, CO	1.04	1.05	1.06	1.11	1.11	1.13
El Paso, TX	0.98	0.98	0.97	1.03	0.98	1.00
Fort Collins, CO	0.95	1.00	0.97	1.07	1.06	1.04
Green Bay, WI	1.05	1.09	1.08	0.89	0.92	0.90
Greensboro-High Point, NC	1.07	1.05	1.12	0.96	0.98	0.99
Houston-The Woodlands-Sugar Land, TX	1.00	1.01	1.00	1.05	1.02	1.03
Jacksonville, FL	1.00	1.01	1.03	0.99	1.07	1.05
Kansas City, MO-KS	1.00	0.99	1.00	1.00	1.00	0.98
Lakeland-Winter Haven, FL	1.03	0.99	1.00	0.91	0.95	0.95
Lexington-Fayette, KY	1.06	1.03	1.05	0.96	0.96	0.94
Louisville/Jefferson County, KY-IN	1.05	1.03	1.04	1.17	1.15	1.15
Miami-Fort Lauderdale-West Palm Beach, FL	0.94	0.95	0.95	1.01	1.00	1.04
Milwaukee-Waukesha-West Allis, WI	1.07	1.03	1.03	0.83	0.84	0.83
New Orleans-Metairie, LA	1.03	1.02	1.01	0.88	0.79	0.72
North Port-Sarasota-Bradenton, FL	1.06	1.05	1.06	0.95	0.97	0.99
Omaha-Council Bluffs, NE-IA	0.99	0.99	1.01	0.82	0.82	0.78
Orlando-Kissimmee-Sanford, FL	0.97	0.97	0.96	1.03	1.06	1.09
Palm Bay-Melbourne-Titusville, FL	1.05	1.05	1.08	0.85	0.90	0.92
Peoria, IL	1.03	1.06	1.04	1.01	0.95	0.90
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.94	0.95	0.95	1.18	1.15	1.13
Phoenix-Mesa-Scottsdale, AZ	0.98	0.98	0.98	1.04	1.05	1.19
St. Louis, MO-IL	1.01	1.03	1.02	0.81	0.80	0.78
San Antonio-New Braunfels, TX	1.01	1.02	1.01	1.23	1.21	1.19
Tampa-St. Petersburg-Clearwater, FL	1.01	0.99	1.00	0.92	0.92	0.89
Trenton, NJ	0.93	0.94	0.96	1.10	1.11	1.10
Tucson, AZ	1.03	1.02	1.05	0.85	0.86	0.91
Tulsa, OK	1.10	1.10	1.07	1.05	1.04	1.08
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.95	0.95	0.94	1.14	1.14	1.16

Source: HCCI, 2015.

The utilization indices were also compared to the price indices. No statistically significant relationship was found between outpatient utilization and prices, and a weak negative correlation was found between inpatient utilization and prices in 2011 and 2013. Correlations coefficients are reported in Table 14.

Table 14. Correlations of price and utilization indices

Within year correlations	2011	2012	2013
Inpatient price to utilization	-0.369**	-0.253	-0.295*
Outpatient price to utilization	0.207	0.203	0.227

Source: HCCI, 2015.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.

Although the correlation of 2012 indices is not statistically significant, those indices can be used to help decompose the negative correlation result because the denominators of both indices are equal in 2012 by construction. The majority of CBSAs have a larger utilization weighted average total price. In other words, for these CBSAs, the mix of inpatient services at the full cohort average price is a greater dollar amount than the mix of services from the full analysis cohort priced at the CBSA-level price. This suggests that prices rather contribute more than utilization to differences in expenditures between CBSAs.

CBSA-specific comparisons of price and utilization indices also demonstrated the lack of a relationship between use and prices. For example, the Bridgeport utilization index values were relatively low (inpatient: 0.95–0.96; outpatient: 0.69–0.71). However, as noted, that CBSA had some of the highest inpatient and outpatient price indices. Similarly, Fort Collins had above average outpatient utilization (1.04–1.07) and low-to-average inpatient utilization (0.95–1.00) but had the highest inpatient (1.43–1.50) and outpatient price index (1.27–1.38) values in every year. Alternatively, Tulsa had high use indices (inpatient: 1.08–1.10, outpatient: 1.04–1.08) but low and average inpatient (0.81–0.82) and outpatient (0.99–1.01) prices.

CBSA population health

To assess relationships between use of health care services and health within a CBSA, measures of CBSA-level population health were constructed from the RWJF County Health Rankings (CHR) data. County-level CHR measures of mortality and morbidity were averaged within a CBSA, weighted by the 18- through 64-year-old ESI county population.[33] Because the CHR measures included multiple years of data and those data were lagged, the CHR report years did not align with the HMI study years. Instead, the 2013 and 2015 CHR reports were used to obtain measures of mortality measured by number of deaths younger than age 75 (premature deaths) and age-adjusted years of potential life lost (YPLL) and age-adjusted percent of adults that report fair/poor health. The 2011 utilization indices were compared to the 2013 CHR fair/poor health measure, which used 2005–2011 data. The 2012 utilization index was compared to the 2015 CHR measures, which used 2006–2012 fair/poor health data and data from 2010–2012 premature deaths and YPLL measures.

[33] The CHR was a convenient and reliable proxy for population health measures. The CHR measures are calculated from the total county population, not the ESI population specifically, so there is potentially a measurement error in this measure for the purposes of the HMI.

Summary statistics of the CHR measures are displayed in Table 15; CBSA-level health measures are included in Table A14. The distribution of fair/poor health did not differ much between report years, likely because of substantial overlap in year of the data used to calculate the CHR measure. Variation was evident in the measures across CBSAs in the HMI, however. For example, the maximum YPLL measure is more than two times greater than the minimum, the interquartile range of premature deaths is approximately 15,000, and the standard deviation of the fair/poor health measure was approximately 3 days.

Table 15. CBSA-level health measure summary statistics

	2013 CHR Fair/poor health	2015 CHR measures		
		Fair/poor health	Premature deaths	YPLL
Mean (Standard deviation)	14.63 (2.95)	14.46 (3.10)	18,772 (17,174)	6,706 (1,181)
Minimum	9.40	9.10	1,860	4,065
25th percentile	12.85	12.76	6,577	6,039
50th percentile	14.53	14.26	11,893	6,772
75th percentile	15.76	15.44	21,532	7,523
Maximum	25.70	25.90	66,526	8,893

Source: HCCI analysis of RWJF County Health Rankings data.
Note: 2013 fair/poor health uses 2005-2011 data, 2015 fair/poor health uses 2006-2012 data, and 2015 premature deaths and YPLL use 2010-2012 data.

The correlation between the inpatient utilization index and the YPLL measure was positive and statistically significant. There was, however, a negative, statistically significant relationship between premature deaths and inpatient utilization. The correlation between outpatient utilization and premature deaths was positive and statistically significant. A statistically significant correlation was not found between outpatient utilization and YPLL or fair/poor health. The difference between the premature deaths and YPLL measures is that YPLL is a rate per 100,000 and is age-adjusted; premature deaths is a raw count. The correlation coefficients are reported for both measures in Table 16.

Table 16. Correlations of utilization indices and CBSA-level health measures

Within year correlations	2013 CHR measures	2015 CHR measures		
	Fair/poor health	Fair/poor health	Premature deaths	YPLL
2011 Inpatient utilization	0.228	0.197	-0.402***	0.639***
2011 Outpatient utilization	0.066	0.070	0.331**	-0.153
2012 Inpatient utilization	-	0.064	-0.427***	0.544***
2012 Outpatient utilization	-	0.025	0.267*	-0.166

Source: HCCI, 2015 and HCCI analysis of RWJF County Health Rankings data.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.
Note: 2013 fair/poor health uses 2005-2011 data, 2015 fair/poor health uses 2006-2012 data, and 2015 premature deaths and YPLL use 2010-2012 data.

Health index

A health index was calculated from individual-level illness measures based on claims data and then aggregated to the CBSA level. An index value of less than 1.00 implies that the CBSA population's average health is better than the sample analysis cohort average health; values greater than 1.00 imply worse than average health.[34] This health measure is based on condition- specific information available in diagnoses and procedures codes included in the claims data. Because it was built from claims data, the measure is specific to the 18- through 64-year-old ESI population from HCCI data that were included in the HMI analysis.

Descriptive statistics of the health index are presented in Table 17. The health index average was equal to 1.00 in every year. Although the variation in health indices across CBSAs was relatively small, some CBSAs did have noticeably better or worse health than average. Health index values less than .96 or .97 (better health) were observed in 25 percent of the CBSAs, and values over 1.04 or 1.05 (worse health) were observed among another 25 percent of the CBSAs.

Table 17. Health index summary statistics

	2011	2012	2013
Mean **(Standard deviation)**	1.00 (0.05)	1.00 (0.05)	1.00 (0.05)
Minimum	0.91	0.91	0.91
25th percentile	0.96	0.97	0.97
50th percentile	1.00	1.00	0.99
75th percentile	1.05	1.04	1.04
Maximum	1.12	1.12	1.13

Source: HCCI, 2015.

Within CBSAs, the health index values were stable over time, and results were consistent with the CHR based health measures. Table 18 shows the correlation coefficients between health index over time and between the health index and CHR measures within years. Although the CHR health measures were not analysis cohort–specific, the measures were correlated with the health index. Within the 2015 CHR measures, Lakeland and Palm Bay are at or above the seventy-fifth percentile of YPLL, and all three of the CBSAs with the highest health index values were at or above the seventy-fifth percentile of fair/poor health. Moreover, Omaha and Fort Collins were below the twenty-fifth percentile of YPLL, and Omaha and Green Bay were below the fair/poor health twenty-fifth percentile.

[34] Health as operationalized for the HMI health index as illness level measured by a weighted ADG count. This is described in detail in Methodology

Table 18. Correlations of health indices across years and with CBSA-level health measures

	2011-2012	2012-2013	2011-2013
Health index	0.982***	0.989***	0.967***
	2015 CHR Fair/poor health	**2015 CHR Premature deaths**	**2015 CHR YPLL**
Health 2011	0.291*	-0.013	0.391**
Health 2012	0.257	-0.034	0.361**

Source: HCCI, 2015.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.
Note: 2013 fair/poor health uses 2005-2011 data, 2015 fair/poor health uses 2006-2012 data, and 2015 premature deaths and YPLL use 2010-2012 data.

CBSA-level health indices by year are shown in Table 19. Across the CBSAs, Lakeland, Miami, and Palm Bay had the highest health indices in all 3 years. Omaha, Fort Collins, and Green Bay consistently had the lowest index values. Although most CBSAs index values were consistently above or below 1.00, New Orleans had decreasing values over the observation period, moving from 1.03 to 0.98, suggesting increasing health.

Table 19. Health index by year

CBSA Name	2011	2012	2013
Atlanta-Sandy Springs-Roswell, GA	1.00	1.00	1.00
Augusta-Richmond County, GA-SC	0.98	0.97	0.98
Austin-Round Rock, TX	0.96	0.96	0.97
Beaumont-Port Arthur, TX	1.06	1.07	1.07
Boulder, CO	0.94	0.94	0.94
Bridgeport-Stamford-Norwalk, CT	1.05	1.04	1.04
Cape Coral-Fort Myers, FL	1.06	1.05	1.06
Cincinnati, OH-KY-IN	0.97	0.96	0.97
Colorado Springs, CO	0.96	0.96	0.96
Columbus, OH	0.98	0.97	0.98
Corpus Christi, TX	1.05	1.04	1.04
Dallas-Fort Worth-Arlington, TX	0.98	0.99	0.99
Dayton, OH	1.01	1.00	1.00
Denver-Aurora-Lakewood, CO	0.96	0.96	0.95
El Paso, TX	0.97	0.97	0.98
Fort Collins, CO	0.91	0.91	0.91
Green Bay, WI	0.91	0.91	0.91
Greensboro-High Point, NC	1.01	1.00	1.01
Houston-The Woodlands-Sugar Land, TX	0.99	0.99	0.99
Jacksonville, FL	1.05	1.05	1.06
Kansas City, MO-KS	0.94	0.95	0.95
Lakeland-Winter Haven, FL	1.10	1.08	1.08
Lexington-Fayette, KY	1.01	1.01	1.03
Louisville/Jefferson County, KY-IN	1.05	1.04	1.03
Miami-Fort Lauderdale-West Palm Beach, FL	1.09	1.08	1.08
Milwaukee-Waukesha-West Allis, WI	0.99	0.98	0.96
New Orleans-Metairie, LA	1.03	1.00	0.98
North Port-Sarasota-Bradenton, FL	1.06	1.06	1.05
Omaha-Council Bluffs, NE-IA	0.92	0.91	0.92
Orlando-Kissimmee-Sanford, FL	1.05	1.05	1.05
Palm Bay-Melbourne-Titusville, FL	1.12	1.12	1.13
Peoria, IL	1.00	1.00	0.99
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.95	0.97	0.97
Phoenix-Mesa-Scottsdale, AZ	1.04	1.03	1.04
St. Louis, MO-IL	0.96	0.96	0.96
San Antonio-New Braunfels, TX	0.99	0.99	0.99
Tampa-St. Petersburg-Clearwater, FL	1.05	1.03	1.03
Trenton, NJ	1.04	1.06	1.06
Tucson, AZ	1.03	1.03	1.03
Tulsa, OK	0.95	0.97	0.97
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.01	1.02	1.02

Source: HCCI, 2015.

Resource index

A resource use index was also calculated from individuals' claims data at the CBSA level. Unlike the utilization index, the resource use index is a measure of average per-person resource use. The interpretations of the two indices are similar, though. A resource use index value less than 1.00 implies that the average resource use in a CBSA was lower than the average resource use of the sample population. A value greater than 1.00 implies greater average resource use. The distribution of resource use index values was similar to the distribution of the health index. Descriptive statistics of the resource index are presented in Table 20.

Table 20. Resource use index summary statistics

	2011	2012	2013
Mean (Standard deviation)	0.99 (0.07)	0.99 (0.07)	0.99 (0.06)
Minimum	0.07	0.07	0.06
25th percentile	0.88	0.87	0.87
50th percentile	0.94	0.94	0.95
75th percentile	1.02	1.02	1.01
Maximum	1.14	1.15	1.17

Source: HCCI, 2015.

The resource use index is positively and statistically significantly correlated over time; however, the resource use index does not necessarily measure the same health services use as the utilization index. This is apparent from correlations of the two indices. The resource use index is not statistically significantly correlated with either utilization index. The resource use index differs from the utilization index in two important ways. First, the resource use index was based on an average intensity-weighted measure of individual health care service use. The use index was a measure of the number of health care services used among a fixed basket of services. Second, the measures are calculated from related but different data. The resource use measure used only professional services claims. The utilization indices used only inpatient and outpatient facility claims. The correlation coefficients of the resource use index over time and between the utilization and resource use indices are presented in Table 21.

Table 21. Correlations of resource use indices across years and to utilization indices

Cross year correlations	2011-2012	2012-2013	2011-2013
Resource use index	0.978***	0.930***	0.936***
Within year correlations	**2011**	**2012**	**2013**
Resource use to inpatient utilization	-0.185	-0.177	-0.014
Resource use to outpatient utilization	0.072	0.198	0.255

Source: HCCI, 2015.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.

CBSA-level resource use indices by year are included in Table 22. Many of the same CBSAs that stood out as the healthiest and least healthy, on the basis of the health index, appeared as the most and least resource-intensive, respectively. Miami and Palm Bay had the highest resource index values across all 3 years, indicating more resource use. Omaha, Fort Collins, and Green Bay consistently had among the lowest resource use indices. The Phoenix CBSA had the highest resource use index in all years but was not among the CBSAs with largest health index values, however. Interestingly, Fort Collins and Green Bay have contrasting utilization indices but consistent resource use indices.

Table 22. Resource indices by year

CBSA Name	2011	2012	2013
Atlanta-Sandy Springs-Roswell, GA	0.99	1.00	0.99
Augusta-Richmond County, GA-SC	0.91	0.97	0.92
Austin-Round Rock, TX	0.98	0.96	0.99
Beaumont-Port Arthur, TX	1.06	1.07	1.07
Boulder, CO	1.01	0.94	0.97
Bridgeport-Stamford-Norwalk, CT	1.07	1.04	1.00
Cape Coral-Fort Myers, FL	1.10	1.05	1.11
Cincinnati, OH-KY-IN	0.95	0.96	0.96
Colorado Springs, CO	1.00	0.96	0.98
Columbus, OH	0.94	0.97	0.97
Corpus Christi, TX	0.99	1.04	1.01
Dallas-Fort Worth-Arlington, TX	1.03	0.99	1.05
Dayton, OH	0.94	1.00	0.94
Denver-Aurora-Lakewood, CO	1.02	0.96	1.01
El Paso, TX	0.94	0.97	0.97
Fort Collins, CO	0.89	0.91	0.91
Green Bay, WI	0.89	0.91	0.88
Greensboro-High Point, NC	0.91	1.00	0.91
Houston-The Woodlands-Sugar Land, TX	1.01	0.99	1.03
Jacksonville, FL	1.07	1.05	1.06
Kansas City, MO-KS	0.92	0.95	0.93
Lakeland-Winter Haven, FL	1.01	1.08	1.02
Lexington-Fayette, KY	0.95	1.01	0.99
Louisville/Jefferson County, KY-IN	1.01	1.04	1.01
Miami-Fort Lauderdale-West Palm Beach, FL	1.12	1.08	1.10
Milwaukee-Waukesha-West Allis, WI	0.95	0.98	0.94
New Orleans-Metairie, LA	0.96	1.00	0.96
North Port-Sarasota-Bradenton, FL	1.02	1.06	1.01
Omaha-Council Bluffs, NE-IA	0.88	0.91	0.91
Orlando-Kissimmee-Sanford, FL	1.01	1.05	1.02
Palm Bay-Melbourne-Titusville, FL	1.12	1.12	1.10
Peoria, IL	0.88	1.00	0.89
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.91	0.97	0.87
Phoenix-Mesa-Scottsdale, AZ	1.14	1.03	1.17
St. Louis, MO-IL	0.93	0.96	0.95
San Antonio-New Braunfels, TX	0.99	0.99	1.00
Tampa-St. Petersburg-Clearwater, FL	1.02	1.03	1.01
Trenton, NJ	1.05	1.06	1.00
Tucson, AZ	0.98	1.03	0.99
Tulsa, OK	0.93	0.97	0.96
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.02	1.02	0.99

Source: HCCI, 2015.

Health-resource use ratio

The HRUR measure of the HMI was developed to provide a single metric to compare levels of health care services use to health. The HRUR is calculated by taking the ratio of the resource use index to the health index. As with the other HMI indices, the baseline HRUR value was 1.00. An index of 1.00 implies that the ratio of resource use to health is the same as the analysis sample. Thus, if a less healthy population receives proportionally more services, the HRUR would still be 1.00. For example, if the HRUR ratio were 1.05, that number suggests that resource use in that CBSA is 5 percent higher than resource use in the full sample relative to the health in the CBSA. However, a value of 1.05 may result from greater resource use (i.e., 1.04/0.99) or lower health (i.e., 1.01/0.96).

The distribution of the HRUR over time is similar in magnitude and variance to the health and resource use indices. The average HRUR ranged from 0.98 in 2011 and 2012 to 0.99 in 2013. However, the median HRUR was 0.96 in 2011 and 2013 and 0.95 in 2012. An HRUR value of less than 1.00 implies that the resource use in the median CBSA was less than would be expected given the median CBSA's health. The HRUR descriptive statistics are shown in Table 23.

Table 23. Health-resource use ratio summary statistics

	2011	2012	2013
Mean (Standard deviation)	0.98 (0.05)	0.98 (0.05)	0.99 (0.05)
Minimum	0.05	0.05	0.04
25th percentile	0.88	0.89	0.89
50th percentile	0.96	0.95	0.96
75th percentile	1.01	1.01	1.00
Maximum	1.10	1.11	1.12

Source: HCCI, 2015.

In all years, the health index was highly and statistically significantly correlated with the resource use index, and the HRUR was positively and statistically significantly correlated over time. Within a CBSA, however, the HRUR proportionally compares resource use to health. For example, Fort Collins had better–than-average health (0.91–0.91) and resource use index values (0.89–0.91), while Palm Bay had worse-than-average component index values (health: 1.12–1.13; resource use: 1.10–1.12), but the HRURs of both CBSAs were near 1.00 in every year. Moreover, the correlations of HRUR over time were not as strong as some of the other HMI indices or even the correlations of the HRUR component indices over time. The correlations are reported Table 24.

Table 24. Correlations of health-resource use ratios across years and resource use to health indices within years

Cross year correlations	2011-2012	2012-2013	2011-2013
HRUR	0.963***	0.882***	0.884***
Within year correlations	**2011**	**2012**	**2013**
Resource use to Health	0.709***	0.690***	0.719***

Source: HCCI, 2015.
*Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level.

HRURs are reported for CBSAs by year in Table 25. The CBSAs with the largest HRUR in all 3 years were Boulder (1.04–1.08), Dallas (1.05–1.06), Phoenix (1.10–1.12), and Denver (1.06–1.07). All these areas had resource use indices that were disproportionately greater than health indices. Augusta (0.91–0.94); Lakeland (0.90–0.94); Greensboro (0.89–0.90); and Lexington (0.94–0.96) had consistently low HRURs, implying lower than proportional resource use for the given health level in the CBSA, The HRURs are also presented with the underlying resource use and health indices by year in appendix Table A15 through Table A17.

Table 25. Health-resource use ratio by year

CBSA Name	2011	2012	2013
Atlanta-Sandy Springs-Roswell, GA	1.00	0.99	0.99
Augusta-Richmond County, GA-SC	0.92	0.91	0.94
Austin-Round Rock, TX	1.02	1.02	1.02
Beaumont-Port Arthur, TX	1.00	0.99	1.00
Boulder, CO	1.08	1.07	1.04
Bridgeport-Stamford-Norwalk, CT	1.02	1.02	0.96
Cape Coral-Fort Myers, FL	1.04	1.03	1.05
Cincinnati, OH-KY-IN	0.98	1.00	0.99
Colorado Springs, CO	1.04	1.05	1.02
Columbus, OH	0.97	0.97	0.99
Corpus Christi, TX	0.94	0.94	0.97
Dallas-Fort Worth-Arlington, TX	1.05	1.05	1.06
Dayton, OH	0.92	0.93	0.94
Denver-Aurora-Lakewood, CO	1.07	1.07	1.06
El Paso, TX	0.97	0.95	0.99
Fort Collins, CO	0.98	1.01	1.00
Green Bay, WI	0.98	0.96	0.96
Greensboro-High Point, NC	0.90	0.89	0.90
Houston-The Woodlands-Sugar Land, TX	1.02	1.02	1.03
Jacksonville, FL	1.01	1.00	1.00
Kansas City, MO-KS	0.97	0.97	0.99
Lakeland-Winter Haven, FL	0.91	0.90	0.94
Lexington-Fayette, KY	0.94	0.95	0.96
Louisville/Jefferson County, KY-IN	0.96	0.98	0.98
Miami-Fort Lauderdale-West Palm Beach, FL	1.03	1.02	1.02
Milwaukee-Waukesha-West Allis, WI	0.96	0.99	0.97
New Orleans-Metairie, LA	0.93	0.95	0.98
North Port-Sarasota-Bradenton, FL	0.96	0.96	0.96
Omaha-Council Bluffs, NE-IA	0.97	0.98	0.98
Orlando-Kissimmee-Sanford, FL	0.97	0.97	0.98
Palm Bay-Melbourne-Titusville, FL	1.00	0.98	0.97
Peoria, IL	0.88	0.90	0.90
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.96	0.93	0.89
Phoenix-Mesa-Scottsdale, AZ	1.10	1.11	1.12
St. Louis, MO-IL	0.96	0.98	0.98
San Antonio-New Braunfels, TX	1.00	1.01	1.01
Tampa-St. Petersburg-Clearwater, FL	0.97	0.97	0.98
Trenton, NJ	1.00	0.99	0.94
Tucson, AZ	0.96	0.95	0.96
Tulsa, OK	0.98	0.98	1.00
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.01	1.00	0.97

Source: HCCI, 2015.

Competition

The two competition measures included in the HMI are both measures of the concentration of services among inpatient hospitals. The concentration measures provide a sense of the way services are allocated within a CBSA and among hospitals within a CBSA, which has implications for policy and research regarding access and use of services. Higher concentration is associated with less competitive markets and may influence price or quality; the HMI measures are provided as a means of identifying the area at which more robust competition analyses could be directed.

In-CBSA admissions

The in-CBSA percentage concentration measure is a tool for comparing the use of inpatient health care services within geographic areas. The measure is a simple representation of the flow of patients receiving inpatient care outside of a given CBSA. The measure can inform policy and research related to competition among hospitals within and outside the CBSA and can provide useful information regarding access and utilization of inpatient services.

The majority of inpatient admissions for individuals residing within a given CBSA occurred at hospitals located within the same CBSA. Table 26 shows summary statistics of the in-CBSA admission percentages for 2012 and 2013.[35] The distributions were similar in both years; however, variation occurred in the rates across CBSAs. Although in the majority of CBSAs more than 90 percent of individuals were admitted to hospitals within their CBSA, in one-fourth of the CBSAs, at least 15 percent of admissions occurred outside the CBSA. In Boulder, Bridgeport, and Lakeland more than 20 percent of individuals were admitted to hospitals outside their CBSA in both years; and in Trenton, more than 40 percent of individuals were admitted to hospitals located outside the CBSA.

Table 26. In-CBSA admissions summary statistics

	2012	2013
Mean (Standard deviation)	89.7% (7.8%)	89.6% (8.0%)
Minimum	57.9%	58.1%
25th percentile	84.3%	83.8%
50th percentile	93.1%	93.1%
75th percentile	95.5%	95.5%
Maximum	96.9%	96.9%

Source: HCCI, 2015 and HCCI analysis of AHA annual survey 2012 and 2013.

The CBSA-level in-CBSA admissions percentages are reported in Table 28. The table also reports the number of hospitals with admissions within each CBSA.[36] Review of the CBSA-level data revealed a relationship

[35] Competition metrics were not calculated for 2011 due to lack of AHA data.
[36] This is not the number of hospitals included in the inpatient price or utilization index calculations.

between CBSAs with lower in-CBSA percentages and the number of hospitals within the CBSA. For example, of the 12 CBSAs at or below the twenty-fifth percentile of in-CBSA admissions in 2013, eight or fewer hospitals were located in each CBSA. Not all CBSAs with fewer hospitals had lower in-CBSA admission percentages, though. The same year saw four CBSAs with in-CBSA admission percentages of more than 94 percent; three of those CBSAs also had eight or fewer hospitals, and the fourth CBSA had nine hospitals.

Further examination of the CBSAs with fewer hospitals demonstrated how the measure could be useful in assessing access issues related to inpatient services. Individuals with few hospital choices within their CBSA do not necessarily have a limited choice of hospitals or limited access to inpatient services if hospitals are located nearby but outside the CBSA. In both years, Trenton, Lakeland, and Boulder are three of the CBSAs with the lowest percentages of in-CBSA admissions among relatively few hospitals. These CBSAs are also relatively small in population. The analysis populations are below the twenty-fifth percentile of the 18- through 64-year-old ESI population included in the HMI analysis. Therefore, a capacity issue forcing individuals to choose hospitals outside the CBSA was unlikely. All three CBSAs are within an approximately 45-minute drive of larger metropolitan area with many more hospitals: Philadelphia, Tampa, and Denver, respectively. Alternatively Peoria and Augusta have similarly small analysis populations and relatively few hospitals within the CBSA, but more than 94 percent of the admissions occurred within the CBSA. Peoria and Augusta are not located as close to larger, neighboring metropolitan areas as the CBSAs mentioned earlier. For example, Peoria is more than 2 hours away from both Chicago, IL and St. Louis, MO.

CBSA-level Herfindahl-Hirschman Index

In general, higher HHIs imply more concentrated markets and are associated with less competition. In the context of the HMI, higher HHIs indicate that more admissions occurred among fewer hospitals within a CBSA.[37] Like the in-CBSA admissions measure, the HHI can inform policy and research related to competition within a CBSA and offers another source of information for assessing access and utilization of inpatient services.[38]

Summary statistics of the HHIs are presented in Table 27; the distributions are similar in both years of analysis. Although some CBSAs have HHIs of more than 2,500, the average HHI in both years is approximately 1,900.[39] Additionally, 75 percent of the CBSAs had HHIs of fewer than 2,611 in 2012 and 2,612 in 2013.

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37 Note, for the HMI HHI calculations all hospitals outside of the CBSA are considered one hospital.

38 The HHI calculations do not account for hospital system affiliations. System identifiers were not available in the hospital characteristics data incorporated with the claims data for the HMI analyses. Hospital concentration measures are likely an overstatement of the amount concentration within markets with multihospital systems.

39 See https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf, for the Federal Trade Commission/Department of Justice criteria for market concentration.

Table 27. CBSA-level Herfindahl-Hirschman Index summary statistics

	2012	2013
Mean (Standard deviation)	1897 (1,183)	1885 (1,138)
Minimum	317	312
25th percentile	915	929
50th percentile	1,895	1,845
75th percentile	2,611	2,612
Maximum	5,267	4,976

Source: HCCI, 2015 and HCCI analysis of AHA annual survey 2012 and 2013.

A larger number of hospitals are associated with lower HHIs. Half of the CBSAs included in the HMI have ten or more hospitals, but numerous factors including hospital characteristics, provider networks, and patient preferences influence how many admissions a hospital has in a year. In 2012, 12 CBSAs had HHIs of fewer than 1,000. All these CBSAs except one accounted for at least 20 hospitals; Denver has 17 hospitals. Alternatively, seven CBSAs in 2012 had at least 15 hospitals each and HHIs greater than 1,000. The average HHI among those seven CBSAs was 1,566. Both years of CBSA-level HHIs are also reported in Table 28.

As explained in the Methodology section and exemplified by the in-CBSA admissions measures, a CBSA is not necessarily a hospital market. The HHI measure results also supported this conclusion. Both Greensboro and Peoria had HHIs of more than 4,500 in 2012 and 2013, with an average of six hospitals per CBSA, per year. However, in Peoria, the in-CBSA shares admission percentage was 94 percent while, in Greensboro, the share was only 84 percent. Although hospital admissions are concentrated among a few hospitals in both CBSAs, a larger share of individuals in Greensboro appear to have access to hospitals outside the CBSA, and the admissions within the CBSA are likely more evenly distributed among hospitals.

Notably, the HMI does not include an evaluation of the inpatient price index relative to the concentration measures. There are numerous reasons it is difficult interpret the results of prices regressed on concentration measures. Particularly prices may influence concentration just as concentration can impact prices. Additionally, the concentration measure calculations were for all admissions to general acute care (GAC) hospitals matched to the AHA data; the price indices were limited to the 100 most common DRGs but may include claims from more than AHA GAC hospitals. The concentration measures were designed to measure a broad set of admissions to similar hospitals. The price index was designed to compare relative price levels of a common set of services. Although these measures are useful independently, future work could investigate the relationship between them.

Table 28. In-CBSA admissions and CBSA-level Herfindahl-Hirschman Indices by year

CBSA Name	Hospital Count		In-CBSA Admissions		CBSA HHI	
	2012	2013	2012	2013	2012	2013
Atlanta-Sandy Springs-Roswell, GA	39	37	92%	92%	655	663
Augusta-Richmond County, GA-SC	9	9	94%	95%	2,684	2,797
Austin-Round Rock, TX	20	21	93%	94%	1,200	1,192
Beaumont-Port Arthur, TX	7	6	84%	83%	2,763	2,702
Boulder, CO	4	4	78%	78%	2,469	2,396
Bridgeport-Stamford-Norwalk, CT	7	7	77%	76%	1,584	1,605
Cape Coral-Fort Myers, FL	5	5	85%	84%	2,611	2,572
Cincinnati, OH-KY-IN	22	20	93%	93%	1,003	1,035
Colorado Springs, CO	3	3	84%	84%	3,833	3,771
Columbus, OH	20	19	96%	96%	1,603	1,639
Corpus Christi, TX	4	4	86%	86%	3,538	3,457
Dallas-Fort Worth-Arlington, TX	73	73	96%	96%	323	312
Dayton, OH	10	10	92%	92%	2,186	2,158
Denver-Aurora-Lakewood, CO	17	17	89%	90%	787	785
El Paso, TX	5	6	95%	96%	2,357	2,236
Fort Collins, CO	4	4	83%	82%	3,085	2,909
Green Bay, WI	6	6	84%	83%	2,679	2,612
Greensboro-High Point, NC	7	6	83%	82%	5,267	4,976
Houston-The Woodlands-Sugar Land, TX	53	52	96%	96%	434	440
Jacksonville, FL	11	11	94%	94%	1,646	1,652
Kansas City, MO-KS	30	32	96%	96%	722	736
Lakeland-Winter Haven, FL	5	5	77%	76%	2,585	2,804
Lexington-Fayette, KY	12	11	93%	92%	2,111	2,052
Louisville/Jefferson County, KY-IN	18	18	97%	97%	1,398	1,410
Miami-Fort Lauderdale-West Palm Beach, FL	49	48	96%	95%	317	324
Milwaukee-Waukesha-West Allis, WI	20	21	96%	96%	925	929
New Orleans-Metairie, LA	18	17	94%	94%	1,284	1,442
North Port-Sarasota-Bradenton, FL	8	8	83%	83%	1,895	1,845
Omaha-Council Bluffs, NE-IA	14	14	96%	95%	1,542	1,478
Orlando-Kissimmee-Sanford, FL	11	11	93%	93%	2,887	2,928
Palm Bay-Melbourne-Titusville, FL	7	7	82%	84%	2,149	2,259
Peoria, IL	6	5	94%	94%	4,745	4,528
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	48	49	92%	92%	409	423
Phoenix-Mesa-Scottsdale, AZ	30	30	96%	96%	551	553
St. Louis, MO-IL	39	38	97%	97%	915	990
San Antonio-New Braunfels, TX	16	16	95%	95%	2,545	2,421
Tampa-St. Petersburg-Clearwater, FL	29	28	93%	93%	727	732
Trenton, NJ	4	4	58%	58%	2,797	2,886
Tucson, AZ	8	8	95%	96%	2,091	663
Tulsa, OK	21	21	94%	95%	1,927	2,797
Washington-Arlington-Alexandria, DC-VA-MD-WV	35	35	87%	87%	546	1,192

Source: HCCI, 2015 and HCCI analysis of AHA annual survey 2012 and 2013.

Conclusion

The HMI includes multiple measures, many of them reported as indices, designed for the purposes of comparing economic aspects of health care across geographic areas. The measures were broadly categorized into the main elements relevant to evaluating health care markets – price, productivity, and competition. Though prices within markets were directly analyzed, productivity and competition were addressed indirectly. The HMI measures provide empirical information to be used in assessing the relationships between the economic aspects to help determine where more detailed analyses may be warranted.

The HMI results support the notion that economic characteristics of health care differ geographically. Moreover, the lack of consistent patterns across measures emphasizes the complexity of the economics of health care. Use of inpatient and outpatient services was not correlated, and use was not correlated with prices. Prices of inpatient and outpatient services were also positively correlated, but there was divergence of the two price levels in numerous CBSAs. Resource use and health were related such that more resources were observed where poorer health was observed.

The research and policy questions that may result from the HMI findings are too varied. Further investigation of all economic aspects addressed by the HMI measures is needed. Some examples include: whether the choice of an inpatient versus outpatient facility, if services are available in both, impacts price levels and/or to outcomes; does poorer health lead to more service use or are inappropriate or unnecessary services more common in areas with poorer health; or are there the implications of hospital concentration on prices as well as utilization of health care.

The analyses disclose a number of limitations of the HMI measures. First, all the analyses were conducted with HCCI data, which were a convenience sample of the U.S. ESI population. Although it comprised more than 25 percent of the total U.S. ESI population, it may not be representative of the prices and use of the entire population. Second, the choice of CBSA as the geographic unit of interest is not necessarily a relevant market boundary for all health care analyses. Markets, in an economic sense, likely differ in size and scope by geography and type of service. Third, the analyses focused on only one population within health care markets. Other populations (e.g., individual coverage, Medicare, Medicaid) potentially influence use and prices. The HMI results should be evaluated with consideration of other populations. Care should be taken when attempting to generalize any of the results. Additionally, the HMI measures were not designed for determining the necessity, appropriateness, or value of health care services.

The HMI measures do not allow for identifying the factors that contribute to higher or lower prices or use, but they provide a tool to identify when and where the underlying factors should be investigated. The measures are intended as a reference for health care leaders, policy makers, or researchers to identify and prioritize potential research. Hopefully, consistent tracking of economic measures of the health care industry will lead to a broader understanding of the "health" market.

Appendix

Table A1. Percentage change in full analysis cohort CBSA populations 2011 to 2013

CBSA Name	Percentage Change
Atlanta-Sandy Springs-Roswell, GA	1.18%
Augusta-Richmond County, GA-SC	-5.57%
Austin-Round Rock, TX	8.29%
Beaumont-Port Arthur, TX	3.12%
Boulder, CO	-0.71%
Bridgeport-Stamford-Norwalk, CT	7.86%
Cape Coral-Fort Myers, FL	-3.00%
Cincinnati, OH-KY-IN	1.87%
Colorado Springs, CO	2.14%
Columbus, OH	-2.64%
Corpus Christi, TX	8.93%
Dallas-Fort Worth-Arlington, TX	-1.67%
Dayton, OH	-9.14%
Denver-Aurora-Lakewood, CO	3.76%
El Paso, TX	5.14%
Fort Collins, CO	3.66%
Green Bay, WI	6.97%
Greensboro-High Point, NC	-10.75%
Houston-The Woodlands-Sugar Land, TX	-0.98%
Jacksonville, FL	-12.60%
Kansas City, MO-KS	-5.64%
Lakeland-Winter Haven, FL	-4.98%
Lexington-Fayette, KY	-3.20%
Louisville/Jefferson County, KY-IN	6.84%
Miami-Fort Lauderdale-West Palm Beach, FL	-4.33%
Milwaukee-Waukesha-West Allis, WI	-4.63%
New Orleans-Metairie, LA	1.09%
North Port-Sarasota-Bradenton, FL	0.36%
Omaha-Council Bluffs, NE-IA	6.73%
Orlando-Kissimmee-Sanford, FL	-3.75%
Palm Bay-Melbourne-Titusville, FL	-6.28%
Peoria, IL	-6.36%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	-7.09%
Phoenix-Mesa-Scottsdale, AZ	4.94%
St. Louis, MO-IL	5.00%
San Antonio-New Braunfels, TX	3.52%
Tampa-St. Petersburg-Clearwater, FL	-1.65%
Trenton, NJ	-3.78%
Tucson, AZ	9.22%
Tulsa, OK	-5.69%
Washington-Arlington-Alexandria, DC-VA-MD-WV	-0.29%

Source: HCCI, 2015.

Table A2. Inpatient price index confidence intervals – 2011

CBSA Name	5th percentile	2011 price index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	0.90	0.90	0.91
Augusta-Richmond County, GA-SC	0.92	0.94	0.97
Austin-Round Rock, TX	0.98	0.99	1.00
Beaumont-Port Arthur, TX	0.92	0.95	0.98
Boulder, CO	1.16	1.20	1.23
Bridgeport-Stamford-Norwalk, CT	1.23	1.25	1.27
Cape Coral-Fort Myers, FL	1.04	1.06	1.08
Cincinnati, OH-KY-IN	0.97	0.97	0.98
Colorado Springs, CO	0.99	1.01	1.04
Columbus, OH	1.03	1.04	1.05
Corpus Christi, TX	0.83	0.85	0.88
Dallas-Fort Worth-Arlington, TX	1.14	1.14	1.15
Dayton, OH	1.18	1.19	1.21
Denver-Aurora-Lakewood, CO	1.05	1.06	1.07
El Paso, TX	1.12	1.16	1.20
Fort Collins, CO	1.36	1.43	1.47
Green Bay, WI	0.92	0.94	0.96
Greensboro-High Point, NC	1.06	1.08	1.10
Houston-The Woodlands-Sugar Land, TX	0.99	1.00	1.01
Jacksonville, FL	1.05	1.06	1.07
Kansas City, MO-KS	0.88	0.89	0.90
Lakeland-Winter Haven, FL	0.93	0.95	0.96
Lexington-Fayette, KY	0.82	0.84	0.86
Louisville/Jefferson County, KY-IN	0.76	0.76	0.77
Miami-Fort Lauderdale-West Palm Beach, FL	0.94	0.95	0.96
Milwaukee-Waukesha-West Allis, WI	1.08	1.09	1.10
New Orleans-Metairie, LA	0.85	0.87	0.89
North Port-Sarasota-Bradenton, FL	0.91	0.93	0.95
Omaha-Council Bluffs, NE-IA	0.98	1.00	1.02
Orlando-Kissimmee-Sanford, FL	1.17	1.19	1.20
Palm Bay-Melbourne-Titusville, FL	1.13	1.15	1.17
Peoria, IL	0.75	0.77	0.79
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.16	1.17	1.18
Phoenix-Mesa-Scottsdale, AZ	1.00	1.00	1.01
St. Louis, MO-IL	0.77	0.78	0.79
San Antonio-New Braunfels, TX	0.86	0.87	0.88
Tampa-St. Petersburg-Clearwater, FL	0.99	0.99	1.00
Trenton, NJ	0.90	0.92	0.96
Tucson, AZ	0.71	0.73	0.74
Tulsa, OK	0.81	0.82	0.84
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.00	1.00	1.01

Source: HCCI, 2015.

Table A3. Inpatient price index confidence intervals – 2012

CBSA Name	5th percentile	2012 price index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	0.91	0.92	0.92
Augusta-Richmond County, GA-SC	0.91	0.94	0.97
Austin-Round Rock, TX	1.00	1.01	1.03
Beaumont-Port Arthur, TX	0.97	1.00	1.02
Boulder, CO	1.15	1.20	1.23
Bridgeport-Stamford-Norwalk, CT	1.20	1.23	1.25
Cape Coral-Fort Myers, FL	1.00	1.03	1.04
Cincinnati, OH-KY-IN	0.98	0.99	0.99
Colorado Springs, CO	1.02	1.05	1.07
Columbus, OH	1.02	1.03	1.04
Corpus Christi, TX	0.80	0.82	0.84
Dallas-Fort Worth-Arlington, TX	1.12	1.12	1.13
Dayton, OH	1.14	1.16	1.17
Denver-Aurora-Lakewood, CO	1.03	1.04	1.06
El Paso, TX	1.13	1.17	1.20
Fort Collins, CO	1.43	1.50	1.54
Green Bay, WI	0.93	0.94	0.96
Greensboro-High Point, NC	1.05	1.07	1.09
Houston-The Woodlands-Sugar Land, TX	0.99	1.00	1.01
Jacksonville, FL	1.07	1.08	1.09
Kansas City, MO-KS	0.88	0.89	0.90
Lakeland-Winter Haven, FL	0.93	0.94	0.96
Lexington-Fayette, KY	0.81	0.82	0.84
Louisville/Jefferson County, KY-IN	0.76	0.76	0.77
Miami-Fort Lauderdale-West Palm Beach, FL	0.93	0.94	0.95
Milwaukee-Waukesha-West Allis, WI	1.08	1.09	1.10
New Orleans-Metairie, LA	0.80	0.81	0.83
North Port-Sarasota-Bradenton, FL	0.91	0.93	0.95
Omaha-Council Bluffs, NE-IA	0.97	0.98	1.00
Orlando-Kissimmee-Sanford, FL	1.21	1.22	1.23
Palm Bay-Melbourne-Titusville, FL	1.12	1.15	1.18
Peoria, IL	0.80	0.82	0.85
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.15	1.16	1.17
Phoenix-Mesa-Scottsdale, AZ	0.99	1.00	1.01
St. Louis, MO-IL	0.76	0.77	0.77
San Antonio-New Braunfels, TX	0.85	0.86	0.87
Tampa-St. Petersburg-Clearwater, FL	1.03	1.04	1.05
Trenton, NJ	0.91	0.94	0.98
Tucson, AZ	0.71	0.72	0.73
Tulsa, OK	0.80	0.81	0.83
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.97	0.98	0.99

Source: HCCI, 2015.

Table A4. Inpatient price index confidence intervals – 2013

CBSA Name	5th percentile	2013 price index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	0.92	0.93	0.93
Augusta-Richmond County, GA-SC	0.91	0.94	0.96
Austin-Round Rock, TX	1.00	1.02	1.03
Beaumont-Port Arthur, TX	0.97	1.00	1.02
Boulder, CO	1.13	1.17	1.21
Bridgeport-Stamford-Norwalk, CT	1.19	1.21	1.23
Cape Coral-Fort Myers, FL	1.00	1.01	1.04
Cincinnati, OH-KY-IN	0.99	1.00	1.01
Colorado Springs, CO	1.00	1.02	1.05
Columbus, OH	1.02	1.03	1.03
Corpus Christi, TX	0.80	0.82	0.84
Dallas-Fort Worth-Arlington, TX	1.13	1.13	1.14
Dayton, OH	1.17	1.18	1.20
Denver-Aurora-Lakewood, CO	1.04	1.05	1.06
El Paso, TX	1.12	1.16	1.19
Fort Collins, CO	1.42	1.47	1.51
Green Bay, WI	0.94	0.96	0.97
Greensboro-High Point, NC	1.05	1.07	1.09
Houston-The Woodlands-Sugar Land, TX	0.96	0.97	0.97
Jacksonville, FL	1.08	1.10	1.11
Kansas City, MO-KS	0.87	0.88	0.89
Lakeland-Winter Haven, FL	0.91	0.93	0.95
Lexington-Fayette, KY	0.82	0.83	0.85
Louisville/Jefferson County, KY-IN	0.75	0.76	0.76
Miami-Fort Lauderdale-West Palm Beach, FL	0.91	0.92	0.92
Milwaukee-Waukesha-West Allis, WI	1.08	1.09	1.10
New Orleans-Metairie, LA	0.79	0.81	0.82
North Port-Sarasota-Bradenton, FL	0.91	0.92	0.94
Omaha-Council Bluffs, NE-IA	1.01	1.02	1.04
Orlando-Kissimmee-Sanford, FL	1.24	1.25	1.26
Palm Bay-Melbourne-Titusville, FL	1.10	1.12	1.14
Peoria, IL	0.78	0.80	0.83
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.18	1.18	1.19
Phoenix-Mesa-Scottsdale, AZ	0.99	1.00	1.01
St. Louis, MO-IL	0.78	0.79	0.79
San Antonio-New Braunfels, TX	0.85	0.86	0.87
Tampa-St. Petersburg-Clearwater, FL	1.04	1.05	1.06
Trenton, NJ	0.89	0.91	0.94
Tucson, AZ	0.71	0.72	0.73
Tulsa, OK	0.80	0.82	0.83
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.97	0.98	0.98

Source: HCCI, 2015.

Table A5. Outpatient price index confidence intervals – 2011

CBSA Name	5th percentile	2011 price index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	0.97	0.97	0.97
Augusta-Richmond County, GA-SC	0.97	0.97	0.98
Austin-Round Rock, TX	1.01	1.02	1.02
Beaumont-Port Arthur, TX	1.08	1.08	1.09
Boulder, CO	1.12	1.13	1.14
Bridgeport-Stamford-Norwalk, CT	1.20	1.20	1.21
Cape Coral-Fort Myers, FL	1.01	1.02	1.03
Cincinnati, OH-KY-IN	0.89	0.90	0.90
Colorado Springs, CO	1.02	1.02	1.03
Columbus, OH	1.04	1.04	1.04
Corpus Christi, TX	1.06	1.07	1.08
Dallas-Fort Worth-Arlington, TX	1.09	1.09	1.09
Dayton, OH	1.02	1.03	1.03
Denver-Aurora-Lakewood, CO	1.23	1.24	1.24
El Paso, TX	1.21	1.22	1.23
Fort Collins, CO	1.37	1.38	1.40
Green Bay, WI	1.08	1.08	1.09
Greensboro-High Point, NC	0.95	0.95	0.96
Houston-The Woodlands-Sugar Land, TX	1.21	1.21	1.21
Jacksonville, FL	0.88	0.88	0.88
Kansas City, MO-KS	0.98	0.99	0.99
Lakeland-Winter Haven, FL	1.09	1.09	1.10
Lexington-Fayette, KY	0.97	0.97	0.98
Louisville/Jefferson County, KY-IN	0.87	0.87	0.88
Miami-Fort Lauderdale-West Palm Beach, FL	1.05	1.05	1.06
Milwaukee-Waukesha-West Allis, WI	1.04	1.04	1.05
New Orleans-Metairie, LA	0.82	0.82	0.82
North Port-Sarasota-Bradenton, FL	0.98	0.99	0.99
Omaha-Council Bluffs, NE-IA	1.02	1.02	1.03
Orlando-Kissimmee-Sanford, FL	0.90	0.90	0.91
Palm Bay-Melbourne-Titusville, FL	1.00	1.01	1.03
Peoria, IL	0.96	0.98	0.99
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.12	1.12	1.12
Phoenix-Mesa-Scottsdale, AZ	0.93	0.93	0.93
St. Louis, MO-IL	0.75	0.75	0.75
San Antonio-New Braunfels, TX	0.99	0.99	0.99
Tampa-St. Petersburg-Clearwater, FL	0.97	0.97	0.97
Trenton, NJ	1.28	1.30	1.30
Tucson, AZ	0.65	0.66	0.66
Tulsa, OK	1.01	1.01	1.02
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.94	0.94	0.94

Source: HCCI, 2015.

Table A6. Outpatient price index confidence intervals – 2012

CBSA Name	5th percentile	2012 price Index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	0.99	0.99	0.99
Augusta-Richmond County, GA-SC	0.94	0.95	0.95
Austin-Round Rock, TX	1.03	1.03	1.03
Beaumont-Port Arthur, TX	1.07	1.08	1.08
Boulder, CO	1.12	1.12	1.13
Bridgeport-Stamford-Norwalk, CT	1.16	1.16	1.17
Cape Coral-Fort Myers, FL	1.03	1.04	1.05
Cincinnati, OH-KY-IN	0.89	0.89	0.89
Colorado Springs, CO	1.04	1.05	1.05
Columbus, OH	1.05	1.05	1.05
Corpus Christi, TX	1.08	1.09	1.09
Dallas-Fort Worth-Arlington, TX	1.10	1.10	1.10
Dayton, OH	1.02	1.02	1.03
Denver-Aurora-Lakewood, CO	1.22	1.22	1.22
El Paso, TX	1.21	1.22	1.23
Fort Collins, CO	1.28	1.30	1.30
Green Bay, WI	1.08	1.08	1.09
Greensboro-High Point, NC	0.97	0.97	0.98
Houston-The Woodlands-Sugar Land, TX	1.23	1.23	1.23
Jacksonville, FL	0.88	0.89	0.89
Kansas City, MO-KS	0.95	0.95	0.95
Lakeland-Winter Haven, FL	1.09	1.11	1.11
Lexington-Fayette, KY	0.94	0.95	0.95
Louisville/Jefferson County, KY-IN	0.85	0.85	0.85
Miami-Fort Lauderdale-West Palm Beach, FL	1.06	1.06	1.06
Milwaukee-Waukesha-West Allis, WI	1.08	1.08	1.09
New Orleans-Metairie, LA	0.81	0.81	0.82
North Port-Sarasota-Bradenton, FL	0.97	0.97	0.98
Omaha-Council Bluffs, NE-IA	0.99	1.01	1.01
Orlando-Kissimmee-Sanford, FL	0.94	0.94	0.94
Palm Bay-Melbourne-Titusville, FL	0.98	0.99	1.00
Peoria, IL	0.91	0.91	0.92
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.09	1.09	1.09
Phoenix-Mesa-Scottsdale, AZ	0.93	0.93	0.93
St. Louis, MO-IL	0.76	0.76	0.77
San Antonio-New Braunfels, TX	0.96	0.97	0.97
Tampa-St. Petersburg-Clearwater, FL	0.98	0.98	0.99
Trenton, NJ	1.29	1.30	1.31
Tucson, AZ	0.68	0.69	0.69
Tulsa, OK	0.99	0.99	0.99
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.92	0.92	0.92

Source: HCCI, 2015.

Table A7. Outpatient price index confidence intervals – 2013

CBSA Name	5th percentile	2013 price index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	1.01	1.01	1.01
Augusta-Richmond County, GA-SC	0.93	0.94	0.94
Austin-Round Rock, TX	1.06	1.07	1.07
Beaumont-Port Arthur, TX	1.09	1.09	1.10
Boulder, CO	1.11	1.12	1.13
Bridgeport-Stamford-Norwalk, CT	1.12	1.12	1.13
Cape Coral-Fort Myers, FL	1.05	1.05	1.06
Cincinnati, OH-KY-IN	0.89	0.89	0.90
Colorado Springs, CO	1.03	1.04	1.05
Columbus, OH	1.06	1.06	1.06
Corpus Christi, TX	1.07	1.08	1.09
Dallas-Fort Worth-Arlington, TX	1.14	1.14	1.14
Dayton, OH	0.95	0.96	0.96
Denver-Aurora-Lakewood, CO	1.23	1.23	1.23
El Paso, TX	1.18	1.19	1.20
Fort Collins, CO	1.26	1.27	1.28
Green Bay, WI	1.10	1.11	1.12
Greensboro-High Point, NC	1.02	1.03	1.03
Houston-The Woodlands-Sugar Land, TX	1.21	1.21	1.21
Jacksonville, FL	0.86	0.87	0.87
Kansas City, MO-KS	0.94	0.94	0.95
Lakeland-Winter Haven, FL	1.12	1.13	1.13
Lexington-Fayette, KY	0.95	0.95	0.96
Louisville/Jefferson County, KY-IN	0.82	0.82	0.82
Miami-Fort Lauderdale-West Palm Beach, FL	1.07	1.08	1.08
Milwaukee-Waukesha-West Allis, WI	1.07	1.07	1.08
New Orleans-Metairie, LA	0.76	0.76	0.76
North Port-Sarasota-Bradenton, FL	0.95	0.96	0.96
Omaha-Council Bluffs, NE-IA	1.01	1.02	1.03
Orlando-Kissimmee-Sanford, FL	0.95	0.95	0.95
Palm Bay-Melbourne-Titusville, FL	1.01	1.01	1.02
Peoria, IL	0.82	0.83	0.84
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.05	1.06	1.06
Phoenix-Mesa-Scottsdale, AZ	0.97	0.97	0.97
St. Louis, MO-IL	0.76	0.77	0.77
San Antonio-New Braunfels, TX	1.00	1.00	1.01
Tampa-St. Petersburg-Clearwater, FL	1.00	1.00	1.00
Trenton, NJ	1.29	1.31	1.31
Tucson, AZ	0.71	0.71	0.72
Tulsa, OK	0.99	0.99	1.00
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.88	0.88	0.89

Source: HCCI, 2015.

Table A8. Inpatient utilization confidence intervals – 2011

CBSA Name	5th percentile	2011 util. index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	1.00	1.01	1.01
Augusta-Richmond County, GA-SC	1.05	1.07	1.09
Austin-Round Rock, TX	0.96	0.97	0.98
Beaumont-Port Arthur, TX	1.09	1.11	1.13
Boulder, CO	0.99	1.01	1.04
Bridgeport-Stamford-Norwalk, CT	0.93	0.95	0.96
Cape Coral-Fort Myers, FL	1.03	1.05	1.07
Cincinnati, OH-KY-IN	1.03	1.04	1.04
Colorado Springs, CO	0.99	1.02	1.04
Columbus, OH	1.03	1.04	1.04
Corpus Christi, TX	1.03	1.05	1.07
Dallas-Fort Worth-Arlington, TX	1.00	1.01	1.01
Dayton, OH	1.03	1.05	1.06
Denver-Aurora-Lakewood, CO	1.03	1.04	1.05
El Paso, TX	0.97	0.98	1.00
Fort Collins, CO	0.92	0.95	0.97
Green Bay, WI	1.03	1.05	1.07
Greensboro-High Point, NC	1.05	1.07	1.09
Houston-The Woodlands-Sugar Land, TX	1.00	1.00	1.01
Jacksonville, FL	0.99	1.00	1.01
Kansas City, MO-KS	0.99	1.00	1.01
Lakeland-Winter Haven, FL	1.01	1.03	1.04
Lexington-Fayette, KY	1.04	1.06	1.07
Louisville/Jefferson County, KY-IN	1.04	1.05	1.05
Miami-Fort Lauderdale-West Palm Beach, FL	0.94	0.94	0.95
Milwaukee-Waukesha-West Allis, WI	1.06	1.07	1.08
New Orleans-Metairie, LA	1.01	1.03	1.04
North Port-Sarasota-Bradenton, FL	1.05	1.06	1.08
Omaha-Council Bluffs, NE-IA	0.98	0.99	1.01
Orlando-Kissimmee-Sanford, FL	0.96	0.97	0.97
Palm Bay-Melbourne-Titusville, FL	1.03	1.05	1.07
Peoria, IL	1.01	1.03	1.05
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.93	0.94	0.94
Phoenix-Mesa-Scottsdale, AZ	0.97	0.98	0.98
St. Louis, MO-IL	1.01	1.01	1.02
San Antonio-New Braunfels, TX	1.00	1.01	1.02
Tampa-St. Petersburg-Clearwater, FL	1.00	1.01	1.02
Trenton, NJ	0.92	0.93	0.95
Tucson, AZ	1.02	1.03	1.05
Tulsa, OK	1.08	1.10	1.11
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.95	0.95	0.96

Source: HCCI, 2015.

Table A9. Inpatient utilization confidence intervals – 2012

CBSA Name	5th percentile	2012 util. index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	1.00	1.00	1.01
Augusta-Richmond County, GA-SC	1.06	1.08	1.10
Austin-Round Rock, TX	0.95	0.96	0.97
Beaumont-Port Arthur, TX	1.12	1.14	1.16
Boulder, CO	1.00	1.02	1.05
Bridgeport-Stamford-Norwalk, CT	0.94	0.95	0.96
Cape Coral-Fort Myers, FL	1.05	1.07	1.09
Cincinnati, OH-KY-IN	1.02	1.03	1.03
Colorado Springs, CO	1.02	1.05	1.07
Columbus, OH	1.02	1.03	1.04
Corpus Christi, TX	1.03	1.05	1.07
Dallas-Fort Worth-Arlington, TX	1.00	1.01	1.01
Dayton, OH	1.03	1.04	1.06
Denver-Aurora-Lakewood, CO	1.04	1.05	1.05
El Paso, TX	0.96	0.98	1.00
Fort Collins, CO	0.97	1.00	1.03
Green Bay, WI	1.06	1.09	1.11
Greensboro-High Point, NC	1.04	1.05	1.07
Houston-The Woodlands-Sugar Land, TX	1.00	1.01	1.01
Jacksonville, FL	1.00	1.01	1.02
Kansas City, MO-KS	0.98	0.99	1.00
Lakeland-Winter Haven, FL	0.98	0.99	1.01
Lexington-Fayette, KY	1.01	1.03	1.04
Louisville/Jefferson County, KY-IN	1.03	1.03	1.04
Miami-Fort Lauderdale-West Palm Beach, FL	0.95	0.95	0.96
Milwaukee-Waukesha-West Allis, WI	1.02	1.03	1.04
New Orleans-Metairie, LA	1.01	1.02	1.04
North Port-Sarasota-Bradenton, FL	1.04	1.05	1.07
Omaha-Council Bluffs, NE-IA	0.97	0.99	1.00
Orlando-Kissimmee-Sanford, FL	0.96	0.97	0.98
Palm Bay-Melbourne-Titusville, FL	1.03	1.05	1.07
Peoria, IL	1.04	1.06	1.07
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.94	0.95	0.95
Phoenix-Mesa-Scottsdale, AZ	0.97	0.98	0.98
St. Louis, MO-IL	1.02	1.03	1.04
San Antonio-New Braunfels, TX	1.01	1.02	1.03
Tampa-St. Petersburg-Clearwater, FL	0.99	0.99	1.00
Trenton, NJ	0.92	0.94	0.96
Tucson, AZ	1.01	1.02	1.03
Tulsa, OK	1.08	1.10	1.11
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.95	0.95	0.96

Source: HCCI, 2015.

Table A10. Inpatient utilization confidence intervals – 2013

CBSA Name	5th percentile	2013 util. index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	1.00	1.01	1.01
Augusta-Richmond County, GA-SC	1.02	1.03	1.05
Austin-Round Rock, TX	0.97	0.98	0.98
Beaumont-Port Arthur, TX	1.13	1.16	1.18
Boulder, CO	0.98	1.01	1.04
Bridgeport-Stamford-Norwalk, CT	0.95	0.96	0.97
Cape Coral-Fort Myers, FL	1.03	1.05	1.06
Cincinnati, OH-KY-IN	1.02	1.03	1.04
Colorado Springs, CO	0.99	1.01	1.04
Columbus, OH	1.00	1.01	1.02
Corpus Christi, TX	1.06	1.08	1.10
Dallas-Fort Worth-Arlington, TX	1.00	1.00	1.01
Dayton, OH	1.02	1.04	1.05
Denver-Aurora-Lakewood, CO	1.05	1.06	1.07
El Paso, TX	0.95	0.97	0.99
Fort Collins, CO	0.94	0.97	0.99
Green Bay, WI	1.06	1.08	1.10
Greensboro-High Point, NC	1.10	1.12	1.14
Houston-The Woodlands-Sugar Land, TX	1.00	1.00	1.01
Jacksonville, FL	1.01	1.03	1.04
Kansas City, MO-KS	0.99	1.00	1.01
Lakeland-Winter Haven, FL	0.98	1.00	1.02
Lexington-Fayette, KY	1.03	1.05	1.06
Louisville/Jefferson County, KY-IN	1.03	1.04	1.05
Miami-Fort Lauderdale-West Palm Beach, FL	0.94	0.95	0.96
Milwaukee-Waukesha-West Allis, WI	1.02	1.03	1.04
New Orleans-Metairie, LA	1.00	1.01	1.02
North Port-Sarasota-Bradenton, FL	1.05	1.06	1.08
Omaha-Council Bluffs, NE-IA	1.00	1.01	1.02
Orlando-Kissimmee-Sanford, FL	0.95	0.96	0.96
Palm Bay-Melbourne-Titusville, FL	1.06	1.08	1.10
Peoria, IL	1.02	1.04	1.06
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.95	0.95	0.96
Phoenix-Mesa-Scottsdale, AZ	0.97	0.98	0.98
St. Louis, MO-IL	1.02	1.02	1.03
San Antonio-New Braunfels, TX	1.00	1.01	1.02
Tampa-St. Petersburg-Clearwater, FL	0.99	1.00	1.00
Trenton, NJ	0.94	0.96	0.98
Tucson, AZ	1.03	1.05	1.06
Tulsa, OK	1.06	1.07	1.09
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.93	0.94	0.94

Source: HCCI, 2015.

Table A11. Outpatient utilization confidence intervals – 2011

CBSA Name	5th percentile	2011 util. index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	1.15	1.15	1.15
Augusta-Richmond County, GA-SC	0.81	0.82	0.82
Austin-Round Rock, TX	1.09	1.10	1.10
Beaumont-Port Arthur, TX	0.97	0.98	0.99
Boulder, CO	1.05	1.06	1.07
Bridgeport-Stamford-Norwalk, CT	0.69	0.69	0.69
Cape Coral-Fort Myers, FL	0.93	0.94	0.94
Cincinnati, OH-KY-IN	0.99	0.99	1.00
Colorado Springs, CO	0.97	0.98	0.99
Columbus, OH	0.86	0.86	0.86
Corpus Christi, TX	1.03	1.04	1.05
Dallas-Fort Worth-Arlington, TX	0.97	0.97	0.97
Dayton, OH	0.91	0.92	0.92
Denver-Aurora-Lakewood, CO	1.10	1.11	1.11
El Paso, TX	1.02	1.03	1.03
Fort Collins, CO	1.06	1.07	1.08
Green Bay, WI	0.89	0.89	0.90
Greensboro-High Point, NC	0.96	0.96	0.97
Houston-The Woodlands-Sugar Land, TX	1.05	1.05	1.05
Jacksonville, FL	0.99	0.99	0.99
Kansas City, MO-KS	0.99	1.00	1.00
Lakeland-Winter Haven, FL	0.90	0.91	0.91
Lexington-Fayette, KY	0.96	0.96	0.96
Louisville/Jefferson County, KY-IN	1.17	1.17	1.17
Miami-Fort Lauderdale-West Palm Beach, FL	1.01	1.01	1.02
Milwaukee-Waukesha-West Allis, WI	0.83	0.83	0.83
New Orleans-Metairie, LA	0.88	0.88	0.88
North Port-Sarasota-Bradenton, FL	0.95	0.95	0.96
Omaha-Council Bluffs, NE-IA	0.81	0.82	0.82
Orlando-Kissimmee-Sanford, FL	1.03	1.03	1.03
Palm Bay-Melbourne-Titusville, FL	0.85	0.85	0.86
Peoria, IL	1.01	1.01	1.02
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.18	1.18	1.19
Phoenix-Mesa-Scottsdale, AZ	1.04	1.04	1.04
St. Louis, MO-IL	0.81	0.81	0.81
San Antonio-New Braunfels, TX	1.23	1.23	1.24
Tampa-St. Petersburg-Clearwater, FL	0.92	0.92	0.92
Trenton, NJ	1.10	1.10	1.11
Tucson, AZ	0.85	0.85	0.85
Tulsa, OK	1.04	1.05	1.05

Source: HCCI, 2015.

Table A12. Outpatient utilization confidence intervals – 2012

CBSA Name	5th percentile	2012 util. index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	1.17	1.18	1.18
Augusta-Richmond County, GA-SC	0.83	0.83	0.84
Austin-Round Rock, TX	1.09	1.10	1.10
Beaumont-Port Arthur, TX	1.00	1.01	1.02
Boulder, CO	1.13	1.13	1.14
Bridgeport-Stamford-Norwalk, CT	0.71	0.71	0.71
Cape Coral-Fort Myers, FL	0.91	0.92	0.92
Cincinnati, OH-KY-IN	1.01	1.01	1.02
Colorado Springs, CO	0.97	0.97	0.98
Columbus, OH	0.88	0.88	0.88
Corpus Christi, TX	1.08	1.08	1.09
Dallas-Fort Worth-Arlington, TX	0.97	0.97	0.97
Dayton, OH	0.94	0.94	0.95
Denver-Aurora-Lakewood, CO	1.11	1.11	1.11
El Paso, TX	0.97	0.98	0.98
Fort Collins, CO	1.05	1.06	1.07
Green Bay, WI	0.91	0.92	0.92
Greensboro-High Point, NC	0.98	0.98	0.99
Houston-The Woodlands-Sugar Land, TX	1.02	1.02	1.02
Jacksonville, FL	1.07	1.07	1.07
Kansas City, MO-KS	1.00	1.00	1.00
Lakeland-Winter Haven, FL	0.94	0.95	0.96
Lexington-Fayette, KY	0.95	0.96	0.96
Louisville/Jefferson County, KY-IN	1.15	1.15	1.15
Miami-Fort Lauderdale-West Palm Beach, FL	1.00	1.00	1.00
Milwaukee-Waukesha-West Allis, WI	0.84	0.84	0.84
New Orleans-Metairie, LA	0.79	0.79	0.80
North Port-Sarasota-Bradenton, FL	0.96	0.97	0.97
Omaha-Council Bluffs, NE-IA	0.82	0.82	0.82
Orlando-Kissimmee-Sanford, FL	1.06	1.06	1.07
Palm Bay-Melbourne-Titusville, FL	0.89	0.90	0.91
Peoria, IL	0.94	0.95	0.95
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.14	1.15	1.15
Phoenix-Mesa-Scottsdale, AZ	1.05	1.05	1.05
St. Louis, MO-IL	0.80	0.80	0.80
San Antonio-New Braunfels, TX	1.21	1.21	1.21
Tampa-St. Petersburg-Clearwater, FL	0.92	0.92	0.92
Trenton, NJ	1.11	1.11	1.12
Tucson, AZ	0.86	0.86	0.87
Tulsa, OK	1.04	1.04	1.04
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.14	1.14	1.14

Source: HCCI, 2015.

Table A13. Outpatient utilization confidence intervals – 2013

CBSA Name	5th percentile	2013 util. index	95th percentile
Atlanta-Sandy Springs-Roswell, GA	1.13	1.14	1.14
Augusta-Richmond County, GA-SC	0.86	0.86	0.87
Austin-Round Rock, TX	1.13	1.13	1.13
Beaumont-Port Arthur, TX	1.03	1.03	1.04
Boulder, CO	1.12	1.13	1.14
Bridgeport-Stamford-Norwalk, CT	0.69	0.69	0.70
Cape Coral-Fort Myers, FL	0.89	0.89	0.90
Cincinnati, OH-KY-IN	1.02	1.02	1.03
Colorado Springs, CO	1.01	1.01	1.02
Columbus, OH	0.90	0.90	0.90
Corpus Christi, TX	1.17	1.18	1.19
Dallas-Fort Worth-Arlington, TX	0.97	0.97	0.97
Dayton, OH	0.92	0.93	0.93
Denver-Aurora-Lakewood, CO	1.13	1.13	1.13
El Paso, TX	1.00	1.00	1.01
Fort Collins, CO	1.03	1.04	1.05
Green Bay, WI	0.89	0.90	0.90
Greensboro-High Point, NC	0.99	0.99	1.00
Houston-The Woodlands-Sugar Land, TX	1.02	1.03	1.03
Jacksonville, FL	1.04	1.05	1.05
Kansas City, MO-KS	0.98	0.98	0.98
Lakeland-Winter Haven, FL	0.95	0.95	0.96
Lexington-Fayette, KY	0.94	0.94	0.95
Louisville/Jefferson County, KY-IN	1.15	1.15	1.16
Miami-Fort Lauderdale-West Palm Beach, FL	1.03	1.04	1.04
Milwaukee-Waukesha-West Allis, WI	0.83	0.83	0.84
New Orleans-Metairie, LA	0.71	0.72	0.72
North Port-Sarasota-Bradenton, FL	0.98	0.99	1.00
Omaha-Council Bluffs, NE-IA	0.78	0.78	0.79
Orlando-Kissimmee-Sanford, FL	1.09	1.09	1.10
Palm Bay-Melbourne-Titusville, FL	0.91	0.92	0.92
Peoria, IL	0.90	0.90	0.91
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1.13	1.13	1.13
Phoenix-Mesa-Scottsdale, AZ	1.19	1.19	1.20
St. Louis, MO-IL	0.78	0.78	0.78
San Antonio-New Braunfels, TX	1.19	1.19	1.20
Tampa-St. Petersburg-Clearwater, FL	0.89	0.89	0.89
Trenton, NJ	1.09	1.10	1.10
Tucson, AZ	0.91	0.91	0.92
Tulsa, OK	1.08	1.08	1.09
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.16	1.16	1.17

Source: HCCI, 2015.

Table A14. County Health Rankings health measures

CBSA Names	2013 Fair/poor Health	2015 Premature Deaths	2015 YPLL	2015 Fair/poor Health
Atlanta-Sandy Springs-Roswell, GA	12.85	48,954	6,263.92	12.33
Augusta-Richmond County, GA-SC	15.76	7,713	8,584.39	15.40
Austin-Round Rock, TX	13.18	11,893	4,899.49	12.87
Beaumont-Port Arthur, TX	16.27	5,421	8,893.29	15.44
Boulder, CO	9.40	1,860	4,064.96	9.10
Bridgeport-Stamford-Norwalk, CT	10.30	6,557	4,459.11	10.00
Cape Coral-Fort Myers, FL	14.80	7,235	6,797.25	13.50
Cincinnati, OH-KY-IN	14.02	24,700	7,473.76	14.30
Colorado Springs, CO	11.82	5,585	6,185.21	11.84
Columbus, OH	13.41	20,471	7,013.65	14.14
Corpus Christi, TX	18.30	4,843	7,698.59	19.94
Dallas-Fort Worth-Arlington, TX	15.03	57,070	6,069.40	14.68
Dayton, OH	14.41	10,328	7,838.06	14.26
Denver-Aurora-Lakewood, CO	12.20	21,532	5,633.36	12.37
El Paso, TX	25.70	6,577	5,844.38	25.90
Fort Collins, CO	10.50	2,217	4,778.98	10.30
Green Bay, WI	13.54	2,693	5,299.82	13.74
Greensboro-High Point, NC	15.23	8,414	7,142.18	14.94
Houston-The Woodlands-Sugar Land, TX	16.94	53,000	6,245.41	16.09
Jacksonville, FL	15.63	16,802	7,848.65	15.58
Kansas City, MO-KS	12.68	21,213	6,568.89	12.76
Lakeland-Winter Haven, FL	19.50	7,886	7,522.72	20.60
Lexington-Fayette, KY	15.06	4,760	6,916.39	14.49
Louisville/Jefferson County, KY-IN	16.80	16,261	8,267.02	17.00
Miami-Fort Lauderdale-West Palm Beach, FL	14.53	52,258	5,842.61	14.44
Milwaukee-Waukesha-West Allis, WI	12.28	15,549	6,339.02	11.91
New Orleans-Metairie, LA	18.75	15,754	8,629.52	18.63
North Port-Sarasota-Bradenton, FL	14.65	8,767	7,195.76	13.87
Omaha-Council Bluffs, NE-IA	11.62	8,235	6,038.20	11.73
Orlando-Kissimmee-Sanford, FL	15.04	20,465	6,222.83	15.27
Palm Bay-Melbourne-Titusville, FL	14.80	7,624	7,962.30	14.00
Peoria, IL	11.41	4,087	6,766.13	10.00
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	13.65	66,526	7,048.14	13.65
Phoenix-Mesa-Scottsdale, AZ	14.79	38,109	6,080.86	14.87
St. Louis, MO-IL	13.79	31,485	7,228.11	13.50
San Antonio-New Braunfels, TX	17.19	20,772	6,772.18	16.71
Tampa-St. Petersburg-Clearwater, FL	17.19	36,081	7,627.79	16.30
Trenton, NJ	14.50	3,369	6,039.03	13.90
Tucson, AZ	14.50	11,078	7,141.97	14.40
Tulsa, OK	17.49	12,660	8,641.77	17.34
Washington-Arlington-Alexandria, DC-VA-MD-WV	10.42	42,848	5,041.08	10.68

Source: HCCI, 2015 and HCCI analysis of RWJF County Health Rankings data.

Note: 2013 fair/poor health uses 2005-2011 data, 2015 fair/poor health uses 2006-2012 data, and 2015 premature deaths and YPLL use 2010-2012 data.

Table A15. HRUR, health index, and resource use index - 2011

CBSA Name	Resource	Health	HRUR
Atlanta-Sandy Springs-Roswell, GA	0.99	1.00	1.00
Augusta-Richmond County, GA-SC	0.91	0.98	0.92
Austin-Round Rock, TX	0.98	0.96	1.02
Beaumont-Port Arthur, TX	1.06	1.06	1.00
Boulder, CO	1.01	0.94	1.08
Bridgeport-Stamford-Norwalk, CT	1.07	1.05	1.02
Cape Coral-Fort Myers, FL	1.10	1.06	1.04
Cincinnati, OH-KY-IN	0.95	0.97	0.98
Colorado Springs, CO	1.00	0.96	1.04
Columbus, OH	0.94	0.98	0.97
Corpus Christi, TX	0.99	1.05	0.94
Dallas-Fort Worth-Arlington, TX	1.03	0.98	1.05
Dayton, OH	0.94	1.01	0.92
Denver-Aurora-Lakewood, CO	1.02	0.96	1.07
El Paso, TX	0.94	0.97	0.97
Fort Collins, CO	0.89	0.91	0.98
Green Bay, WI	0.89	0.91	0.98
Greensboro-High Point, NC	0.91	1.01	0.90
Houston-The Woodlands-Sugar Land, TX	1.01	0.99	1.02
Jacksonville, FL	1.07	1.05	1.01
Kansas City, MO-KS	0.92	0.94	0.97
Lakeland-Winter Haven, FL	1.01	1.10	0.91
Lexington-Fayette, KY	0.95	1.01	0.94
Louisville/Jefferson County, KY-IN	1.01	1.05	0.96
Miami-Fort Lauderdale-West Palm Beach, FL	1.12	1.09	1.03
Milwaukee-Waukesha-West Allis, WI	0.95	0.99	0.96
New Orleans-Metairie, LA	0.96	1.03	0.93
North Port-Sarasota-Bradenton, FL	1.02	1.06	0.96
Omaha-Council Bluffs, NE-IA	0.88	0.92	0.97
Orlando-Kissimmee-Sanford, FL	1.01	1.05	0.97
Palm Bay-Melbourne-Titusville, FL	1.12	1.12	1.00
Peoria, IL	0.88	1.00	0.88
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.91	0.95	0.96
Phoenix-Mesa-Scottsdale, AZ	1.14	1.04	1.10
St. Louis, MO-IL	0.93	0.96	0.96
San Antonio-New Braunfels, TX	0.99	0.99	1.00
Tampa-St. Petersburg-Clearwater, FL	1.02	1.05	0.97
Trenton, NJ	1.05	1.04	1.00
Tucson, AZ	0.98	1.03	0.96
Tulsa, OK	0.93	0.95	0.98
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.02	1.01	1.01

Source: HCCI, 2015.

Table A16. HRUR, health index, and resource use index - 2012

CBSA Name	Resource	Health	HRUR
Atlanta-Sandy Springs-Roswell, GA	1.00	1.00	0.99
Augusta-Richmond County, GA-SC	0.97	0.97	0.91
Austin-Round Rock, TX	0.96	0.96	1.02
Beaumont-Port Arthur, TX	1.07	1.07	0.99
Boulder, CO	0.94	0.94	1.07
Bridgeport-Stamford-Norwalk, CT	1.04	1.04	1.02
Cape Coral-Fort Myers, FL	1.05	1.05	1.03
Cincinnati, OH-KY-IN	0.96	0.96	1.00
Colorado Springs, CO	0.96	0.96	1.05
Columbus, OH	0.97	0.97	0.97
Corpus Christi, TX	1.04	1.04	0.94
Dallas-Fort Worth-Arlington, TX	0.99	0.99	1.05
Dayton, OH	1.00	1.00	0.93
Denver-Aurora-Lakewood, CO	0.96	0.96	1.07
El Paso, TX	0.97	0.97	0.95
Fort Collins, CO	0.91	0.91	1.01
Green Bay, WI	0.91	0.91	0.96
Greensboro-High Point, NC	1.00	1.00	0.89
Houston-The Woodlands-Sugar Land, TX	0.99	0.99	1.02
Jacksonville, FL	1.05	1.05	1.00
Kansas City, MO-KS	0.95	0.95	0.97
Lakeland-Winter Haven, FL	1.08	1.08	0.90
Lexington-Fayette, KY	1.01	1.01	0.95
Louisville/Jefferson County, KY-IN	1.04	1.04	0.98
Miami-Fort Lauderdale-West Palm Beach, FL	1.08	1.08	1.02
Milwaukee-Waukesha-West Allis, WI	0.98	0.98	0.99
New Orleans-Metairie, LA	1.00	1.00	0.95
North Port-Sarasota-Bradenton, FL	1.06	1.06	0.96
Omaha-Council Bluffs, NE-IA	0.91	0.91	0.98
Orlando-Kissimmee-Sanford, FL	1.05	1.05	0.97
Palm Bay-Melbourne-Titusville, FL	1.12	1.12	0.98
Peoria, IL	1.00	1.00	0.90
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.97	0.97	0.93
Phoenix-Mesa-Scottsdale, AZ	1.03	1.03	1.11
St. Louis, MO-IL	0.96	0.96	0.98
San Antonio-New Braunfels, TX	0.99	0.99	1.01
Tampa-St. Petersburg-Clearwater, FL	1.03	1.03	0.97
Trenton, NJ	1.06	1.06	0.99
Tucson, AZ	1.03	1.03	0.96
Tulsa, OK	0.97	0.97	0.98
Washington-Arlington-Alexandria, DC-VA-MD-WV	1.02	1.02	1.01

Source: HCCI, 2015.

Table A17. HRUR, health index, and resource use index - 2013

CBSA Name	Resource	Health	HRUR
Atlanta-Sandy Springs-Roswell, GA	0.99	1.00	0.99
Augusta-Richmond County, GA-SC	0.92	0.98	0.94
Austin-Round Rock, TX	0.99	0.97	1.02
Beaumont-Port Arthur, TX	1.07	1.07	1.00
Boulder, CO	0.97	0.94	1.04
Bridgeport-Stamford-Norwalk, CT	1.00	1.04	0.96
Cape Coral-Fort Myers, FL	1.11	1.06	1.05
Cincinnati, OH-KY-IN	0.96	0.97	0.99
Colorado Springs, CO	0.98	0.96	1.02
Columbus, OH	0.97	0.98	0.99
Corpus Christi, TX	1.01	1.04	0.97
Dallas-Fort Worth-Arlington, TX	1.05	0.99	1.06
Dayton, OH	0.94	1.00	0.94
Denver-Aurora-Lakewood, CO	1.01	0.95	1.06
El Paso, TX	0.97	0.98	0.99
Fort Collins, CO	0.91	0.91	1.00
Green Bay, WI	0.88	0.91	0.96
Greensboro-High Point, NC	0.91	1.01	0.90
Houston-The Woodlands-Sugar Land, TX	1.03	0.99	1.03
Jacksonville, FL	1.06	1.06	1.00
Kansas City, MO-KS	0.93	0.95	0.99
Lakeland-Winter Haven, FL	1.02	1.08	0.94
Lexington-Fayette, KY	0.99	1.03	0.96
Louisville/Jefferson County, KY-IN	1.01	1.03	0.98
Miami-Fort Lauderdale-West Palm Beach, FL	1.10	1.08	1.02
Milwaukee-Waukesha-West Allis, WI	0.94	0.96	0.97
New Orleans-Metairie, LA	0.96	0.98	0.98
North Port-Sarasota-Bradenton, FL	1.01	1.05	0.96
Omaha-Council Bluffs, NE-IA	0.91	0.92	0.98
Orlando-Kissimmee-Sanford, FL	1.02	1.05	0.98
Palm Bay-Melbourne-Titusville, FL	1.10	1.13	0.97
Peoria, IL	0.89	0.99	0.90
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.87	0.97	0.89
Phoenix-Mesa-Scottsdale, AZ	1.17	1.04	1.12
St. Louis, MO-IL	0.95	0.96	0.98
San Antonio-New Braunfels, TX	1.00	0.99	1.01
Tampa-St. Petersburg-Clearwater, FL	1.01	1.03	0.98
Trenton, NJ	1.00	1.06	0.94
Tucson, AZ	0.99	1.03	0.96
Tulsa, OK	0.96	0.97	1.00
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.99	1.02	0.97

Source: HCCI, 2015.