Using the County Health Rankings Framework to Create National Percentile Scores for Health Outcomes and Health Factors

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ABSTRACT

Introduction: As a means of conceptualizing population health, the County Health Rankings & Roadmaps program developed a methodology to rank counties within each state on Health Outcomes and Health Factors. We built on this framework by introducing an additional application that utilized national percentile scores and population size weighting to compare counties on a national, rather than a state, level.

Methods: We created national percentile scores for 3078 US counties and used population size weighting in our calculations so that values for counties with larger populations would be weighted more heavily than values for counties with smaller populations.

Results: We demonstrated how this application can be used to 1) compare counties nationally, 2) examine clustering and variability among counties, and 3) compare the health of states and regions. To underscore its utility, we included an example application by Kaiser Permanente. As a form of method validation, the results of this application are in line with other ranking systems (eg, US News and World Report and United Health Foundation; \( r = 0.39 \) to 0.91, \( p < 0.001 \)).

Discussion: This application can be used by communities and organizations that may be interested in comparing the health of counties, service areas, and regions in which they operate. We included additional considerations and highlighted some limitations for those interested in utilizing this application.

Conclusion: By comparing counties nationally and utilizing population size weighting, community partners can focus on areas that may be of greatest need in moving toward a national Culture of Health.

INTRODUCTION

Each year, the County Health Rankings & Roadmaps program (CHR&R), supported by the University of Wisconsin Population Health Institute (UWPHI) and the Robert Wood Johnson Foundation, publishes the County Health Rankings (CHR). The CHR report the within-state ranks of more than 3,000 US counties based on a variety of health measures. For their methodology, the program used a conceptual model of population health that emphasized the multi-dimensional concept of health and well-being by measuring outcomes and factors that, if improved, could help make communities healthier places to live, learn, and work (see Figure 1 for the CHR model). Initially developed in 2002 as a methodology to rank county health in Wisconsin, UWPHI expanded its reporting to all 50 states in 2008 with the help of a grant from the Robert Wood Johnson Foundation for an initiative entitled Mobilizing Action Toward Community Health. The CHR&R continued to rank counties within a state, because their goal was to “raise awareness about the many factors that influence health and that health varies from place to place, not to produce a list of the healthiest 10 or 20 counties in the nation and only focus on that.”

Over the years, a variety of groups nationwide have used the CHR for community engagement, policy and decision-making support, and tracking, identifying, and assessing community health issues (see the latest CHR Key Findings Report and the Communities Using the Rankings Data page on the CHR website for examples).

To rank each county within-state, the CHR&R used county-level measures from a variety of national, state, and local data sources (eg, American Community Survey, Behavioral Risk Factor Surveillance Survey, Dartmouth Atlas of Care, and National Center for Health Statistics). The CHR&R combined these measures using scientifically informed weights and created 2 indices: Health Outcomes and Health Factors. Health Outcomes are a combination of 2 equally weighted indices (ie, length of life and quality of life), and Health Factors combined scores on 4 unequally weighted indices (ie, health behaviors, clinical care, social and economic factors, and physical environment). Each of the indices was a composite of one or more unequally weighted indicators (eg, health behaviors comprised tobacco use, diet and exercise, alcohol and drug use, and sexual activity indicators), for a total of 35 indicators (see the 2018 County Health Rankings National Data document for a detailed list of the indicators and metrics).

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The Current Study

In line with other organizations such as US News and World Report and United Health Foundation that use national, rather than within-state, ranking methodologies, the current study introduces an additional application of the CHR data that allows for the comparison of counties across the nation. By comparing counties within-nation, rather than within-state, this application of the CHR methodology and data helps further the goal of the CHR&R by allowing one the ability to examine the health of a county not only at the state level but also the regional and national levels. Further, this application can be customized to fit the needs of organizations that may be interested in comparing the health of different service areas or regions across state boundaries. We first summarize the original CHR methodology and indicate the key modifications made in the current application to compare counties across the nation: the creation of national percentile scores for each county and the utilization of population size weighting based on each county’s population size. We then report findings as a result of these modifications; in this section, we highlight how the methodology allows for exploration into the distance between counties and patterns of clustering. Following the results of these analyses, we end with an example application of this methodology by Kaiser Permanente (KP) to demonstrate how organizations, in addition to communities, can utilize this methodology to understand its members’ health and healthcare needs better.

METHODS

Data Sources

We used CHR 2018 data from the CHR&R website; the data for 2018, as well as for prior and subsequent years, are freely accessible. The CHR&R excluded 64 counties for being too small for reliable data. These counties also were excluded from our analyses, and the final sample size for the CHR and our application was 3078 counties. For our analyses, we used SAS Enterprise Guide statistical software Version 6.1 and SPSS version 25.

Original CHR Methodology

In the original methodology, the CHR&R first standardized all the indicators, because the indicators were heterogeneous in what they measured and their units (eg, rates per thousand and percentages). To standardize the indicators, the CHR&R converted the indicator values to z-scores, a unit-free measure with mean = 0 and standard deviation = 1. They did this by taking the difference between the county value and the average value across all the counties in the state and then dividing this difference by the standard deviation for all the counties in the state. The CHR&R truncated z-scores < −3 or > 3 to −3 and +3, respectively, when a county had a population of 20,000 or less, as extreme values could lead to imprecise estimates due to small sample sizes. For counties missing data for individual measures, the CHR&R entered the state mean (ie, mean imputation). Following this z-score conversion process, the CHR&R reverse-coded 7 of the 35 indicators so that larger z-scores indicated poorer health.

After the CHR&R calculated all z-scores, they created weighted composite scores for the 6 top-level indices (ie, length of life, quality of life, health behaviors, clinical care, social and economic factors, and physical environment), Health Outcomes, and Health Factors. To create the composites, the CHR&R summed the product of each measure (ie, $Z_i$) and its pre-determined weight (ie, $w_i$).

To determine county ranks within each state, the CHR&R sorted counties based on their composite scores. The county with the lowest z-score, representing the county with the best health, ranked first in the state. The next county ranked 2nd; this continued until all the counties within the state had an assigned rank.

Modifications to CHR Methodology

Because our goal was to be able to compare counties across the nation, we made a series of modifications to the initial standardization step in the CHR methodology.
Modifications included: 1) using national—rather than state—means and standard deviations to calculate z-scores, 2) using population size weighting, 3) reversing the coding in the original CHR methodology, 4) re-standardizing composites, and 5) creating national percentile scores.

**Z-Scores Using National Means and Standard Deviations**

Rather than calculating z-scores based on the state means and standard deviations as in the CHR, we used all 3078 counties in the nation to calculate the national means and standard deviations for each of the 35 indicators originally used in the CHR. We then used these values to calculate the z-scores for each indicator. In this step, we used population size weighting based on each county’s population size to address the issue of the disproportionate impact of small counties on the national mean and standard deviation. For example, the largest county, Los Angeles in California with 10,137,915 residents, has a much greater impact on the national mean than the smallest county, Bristol Bay Borough in Alaska with 898 residents.

**Reverse Coding**

Opposite of the CHR&R, we retained the 7 indicators that had been reverse-coded in the original methodology. Instead, we reverse-coded the remaining 28 indicators. The purpose of this modification was to make the scoring more intuitive, such that larger z-scores represented better health.

**Re-Standardizing Composites**

After we created the composites by adding together the weighted z-scores for each indicator, we no longer had standardized values. Because standardized values were necessary to generate national percentile scores based on a probability distribution (as opposed to rank order), the first step was another round of standardization using population size weighting for the 6 top-level indices (i.e., length of life, quality of life, health behaviors, clinical care, social and economic factors, and physical environment), Health Outcomes, and Health Factors (i.e., creation of z-scores for the newly calculated composites). For example, we created z-scores for Health Outcomes by taking the difference between a county’s composite value (i.e., a weighted sum of all indicators contributing to Health Outcomes) and the national mean composite value and then dividing this difference by the standard deviation for all the counties in the nation.

**National Percentile Scores**

The next step was to determine national percentile scores based on percentages associated with z-scores on a standard normal (Gaussian) distribution. However, we first needed to ensure the data were normally distributed. As skew and kurtosis for Health Outcomes (skew = -0.88, kurtosis = 2.07) and Health Factors (skew = -0.81, kurtosis = 1.97) violated the assumption of normality necessary to convert the z-scores to percentiles, which requires the distributions to be as close to a normal distribution as possible, we used a transformation. We first multiplied the z-scores by -1 and then added 5 to each value to ensure all the values were positive; we then used a log transformation. To ensure larger z-scores indicated better health, each value was then multiplied by -1. After transforming the data, we again examined skew and kurtosis for Health Outcomes and Health Factors. Results indicated the transformations sufficed, and the distributions were indeed normal (Health Outcomes, skew = -0.11, kurtosis = -0.12; Health Factors, skew = 0.08, kurtosis = 0.32). We proceeded with the creation of the national percentile scores. These values represented the estimated percentage of counties at or below a certain z-score. Compared to z-scores, the national percentiles scores are easier to understand and interpret when examining patterns of clustering.

**RESULTS**

**Comparing Counties Nationally**

The primary purpose of this application was to provide communities and organizations with a method of utilizing the CHR framework and their data to compare counties nationally that can be customized to fit their needs. Our goal for the results section was not to publish a new list of county rankings but rather to demonstrate the utility of this application. After calculating national percentile scores for the 3078 counties, we created 2 US maps that allow for comparisons of counties across the nation for Health Outcomes (Figure 2) and Health Factors (Figure 3).

**Assessing Clustering and Variability Among Counties**

Figures 2 and 3 depict areas of clustering (i.e., counties with similar scores on Health Outcomes and Health Factors) when examining all the counties in the nation, primarily among counties in the southern, mid-west, and New England regions. For example, the mid-west and New England regions had clusters of counties with some of the highest national percentile scores, while the southern region had a large cluster of counties below the 25th percentile. By comparing counties across state borders in this way, communities and organizations are able to see how a county, service area, and region are doing overall.

National percentile scores also provided additional, valuable information about clustering among counties.
within a state. For example, national percentile scores for Mississippi’s top 10 counties ranged from the 31st to the 62nd national percentile, whereas national percentile scores for Minnesota’s top 10 counties clustered at the 99th national percentile (Table 1).

We also can examine variability among counties by examining a boxplot (Figure 4), a graphical depiction of the data that uses a five-number summary: minimum value, first quartile (25th percentile), median (50th percentile), third quartile (75th percentile), and maximum value. The central rectangle (ie, box) represents the interquartile range (IQR), a statistical measure of dispersion based on the middle 50% of the data (ie, 25% above and below the median); the larger the value, the greater the dispersion. The lines extending from the rectangle (ie, whiskers) represent the minimum and maximum values within the lower limit (ie, the first quartile minus 1.5 times the IQR: Q1 − 1.5 * IQR) and the upper limit (ie, the third quartile plus 1.5 times the IQR: Q3 + 1.5 * IQR). Circles, as seen in Figure 4, represent mild outliers (ie, beyond Q1 − 1.5 * IQR or Q3 + 1.5 * IQR but within Q1 − 3 * IQR or Q3 + 3 * IQR); asterisks indicate extreme outliers (ie, beyond Q1 − 3 * IQR or Q3 + 3 * IQR). Figure 4 demonstrates differences in IQR for a sample of states of varying sizes for Health Outcomes. For example, Minnesota and Michigan have similar numbers of counties, but Minnesota’s IQR (8.64) is much smaller than Michigan’s (24.74), indicating greater clustering.

**Additional Uses of This Application**

We also used the national percentile scores to explore the health of each state by 1) examining the percentage of counties within a state that fall above a certain percentile, and 2) calculating each state’s average percentile score. In terms of Health Outcomes, ~90% of the counties in Minnesota (N = 87) were above the 75th national percentile, whereas 0% of the counties in Mississippi (N = 82) met this threshold. Only 1 county in Minnesota was below the 25th national percentile, whereas the majority (84%) of counties in Mississippi fell below this threshold. We also calculated the average national percentile score by state, which allowed us to array each state from healthiest to least healthy (Table 2).

**Kaiser Permanente Application—Community Health Report**

Kaiser Permanente (KP) adopted the methodology described above to create a “Community Health Report” (CH report) that provides a high-level view of the current status and long-term population health trends of the health of the

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**Figure 2.** N = 3,078. National percentile scores for Health Outcomes (weighted by county population size).
total populations of 8 KP regions across the nation. The CH Report was designed primarily for internal KP stakeholders (eg, Board, regional Presidents, Executive MDs, and leaders in the KP regions and KP service areas) to create a common understanding among organizational leaders about the factors that create healthy communities. The CH Report highlights areas where greater focus is needed and supports discussions about strategies aimed at addressing those health needs. In the future, KP can use the report to engage community partners (eg, health departments, state
and local governments, and community-based organizations) to help improve health outcomes in the long-run.

**CH Report Data Sources and Measures**

The data used in the CH Report come from the KP Community Health Needs Assessment data platform. In assembling indicators, KP used the CHR measures as a starting point and added 2 health equity measures and 6 health status indicators that measure morbidity or mortality rates for cancer, coronary heart disease, diabetes, stroke, opioids, and mental health. (We describe the construction of KP’s health equity indices below.) Further, KP replaced the CHR physical environment index with 2 indices—one representing the built environment (eg, housing costs and neighborhood walkability) and another focused more on environmental sustainability (eg, air pollution and drought severity). Figure 5 includes a complete list of the individual indicators grouped by index where appropriate.

**Adjusting for KP Boundaries that Do Not Match Counties**

Because KP service area and regional boundaries often do not align with county boundaries, KP used a similar weighting approach based on population size to construct estimates for each service area. First, they used census-tract level data to estimate the fraction of the total county population contained in the service area. They then used that population size as a weight when computing the indicator value for the whole service area. For example, suppose a KP service area comprised 2 complete counties and 1 partial county, where all counties are the same size (100 K population), and the partial county is 50% contained within KP boundaries. Next, assume that the smoking rate was 15% in the 2 complete counties and 30% in the partial county. The overall smoking rate would then be 18% (as seen below). Although this approach allowed partial counties to be included in the KP service area calculations, it is important to note that the values of counties entirely captured within a KP service area may have greater correspondence with the relevant KP region in total than partial counties.

\[
100 \times 15\% + 100 \times 15\% + 50 \times 30\%/(100 K + 100 K + 50 K) = 18\%.
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**Computing the KP Health Equity Indices**

KP first created a composite measure called the Opportunity Index, comprised of factors such as unemployment,
Creating Percentiles and 2019 CH Report Example

The final step in creating the CH Report was to use the same methodology described above to calculate percentile scores for both KP regions and KP service areas for the 8 indices and 7 individual indicators. Figure 6 shows the topline CH report showing percentile values for KP overall and the 8 regions. In addition to the topline CH report, KP also created customized reports at the level of KP service areas. KP disseminated the initial CH Report to a range of internal KP audiences to introduce the concept and explain the methodology. A team from national Community Health visited each of the KP regions and met with Community Health and other KP staff (eg, Strategy and Communications). Interactive learning techniques were used to engage participants in a session that presented the report, answered questions, and gathered feedback to make improvements. The CH Report is now a regular part of the KP Board reporting cycle; data are refreshed once per year, and the updated report is presented to the Board by Community Health leadership.

DISCUSSION

Since its initiation, the purpose of the CHR was to provide communities and organizations with information to help answer the question, “How healthy are our communities?” with the goal that this information would serve as a foundation to build, and continue to build over time, a Culture of Health.1 We proposed an additional application of the original CHR methodology that would allow for a comparison of counties across state boundaries. Using the CHR methodology as a foundation, we utilized national percentile scores and weighted the counties by population size when we calculated estimates. This method allowed for further exploration regarding the relationships among the counties, namely, patterns of clustering and the distance between counties. Communities and organizations interested in using this methodology are not limited to county and state borders, as this methodology can be tailored for groups of areas as well. For the Community Health Report, KP used population weighting based on population size to calculate initial indicator estimates for KP service areas, KP regions, and KP overall, rather than for individual counties, to compare across KP regions in different parts of the country.

Our comparison of counties on a national level was consistent with the approach of other existing organizations. For example, US News and World Report8, in collaboration with the Aetna Foundation, publishes the Healthiest Communities Rankings using 81 different metrics assigned to 10 categories: population health, equity, education, economy, infrastructure, community vitality, public safety, environment, food and nutrition, and housing. The annual report ranks the top 500 counties in the United States using an index score of 0 to 100 maximum points. In comparison to the number of counties in the 2018 CHR dataset, the 2018 Healthiest Communities Rankings8 compared fewer counties (N = 2891) based on different exclusion criteria.15 Although the Healthiest Communities Rankings did not include any form of population weighting, US News and World Report took an additional step and divided up counties into 1 of 4 peer groups based on

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Using the County Health Rankings Framework to Create National Percentile Scores for Health Outcomes and Health Factors

### TOP-LINE METRICS
- **Length of life**: Premature death (years of potential life lost)
- **Quality of life**: Low birthweight, Poor or fair health, Poor mental health days, Poor physical health days
- **Health equity**: Racial/ethnic disparity in: Breast cancer screening, Recent primary care visit, Preventable hospital stays, Infant mortality, Heart disease mortality, Cancer mortality, Stroke mortality

### HEALTH STATUS
- **Morbidity & mortality**: Cancer, Coronary heart disease, Diabetes prevalence, Opioid deaths, Stroke

### HEALTH FACTORS
- **Health behaviors**: Access to exercise opportunities, Adult obesity, Adult smoking, Alcohol-impaired driving deaths, Excessive drinking, Food Environment Index, Physical inactivity, Sexually transmitted infections, Teen births

### CLINICAL CARE
- Access to dentists
- Access to mental health providers
- Access to primary care physicians
- Diabetes monitoring
- Mammography screening
- Preventable hospital stays
- Uninsured

### SOCIAL & ECONOMIC FACTORS
- Children in poverty
- Children in single-parent households
- High school graduation
- Income inequality
- Injury deaths
- Social associations
- Some college
- Unemployment
- Violent crimes

### PHYSICAL ENVIRONMENT
- Air quality
- Drinking water violations
- Driving alone to work
- Long commute, driving alone
- Severe housing problems

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**Figure 5.** Indices and indicators used in Kaiser Permanente’s Community Health Report.

**Figure 6.** Kaiser Permanente’s (KP) 2019 Community Health Report. Percentiles show KP values compared to the national distribution (see text for methods). All variables have been coded, so larger values are in a positive direction.

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their population-density (ie, urban versus rural) and economic performance (ie, high performing versus up-and-coming) to allow for comparisons across similar counties.

Even with some differences in measures and methodology, several of the same top-scoring counties based on this national percentile score application also ranked at the top of the 2018 US News and World Report’s Healthiest Communities Rankings.\(^8\) In the current study, Douglas County in Colorado had the highest percentile score of all US counties for Health Factors. In the 2018 Healthiest Communities Rankings, Douglas County was the 2\(^{nd}\) top-ranked county in 2018, and the top-ranked county in 2019, for their overall score across the 10 categories. Los Alamos County in New Mexico, which had the third-largest percentile score using our methodology, also ranked 3\(^{rd}\) on the Healthiest Communities Rankings 2018 and 2\(^{nd}\) in 2019. In total, 31 of the top 50 counties in our study also were in the top 50 in the Healthiest Communities Rankings. Results of 2 Spearman rank correlations indicated moderate positive correlations between the 500 counties ranked in the Healthiest Communities Rankings and the county rankings for Health Outcomes (\(\rho = 0.39, p < 0.001\)) and Health Factors (\(\rho = 0.57, p < 0.001\)) based on the national percentile score application.

Rather than ranking counties, United Health Foundation’s America’s Health Rankings\(^9\) ranks all 50 states based on 30 metrics assessing behaviors, community and environment, clinical care, and policy. In their 2018 rankings, Hawaii, Massachusetts, Connecticut, Vermont, Utah, New Hampshire, Minnesota, Colorado, Washington, and New York were the top 10 ranked states while Indiana, Tennessee, South Carolina, West Virginia, Kentucky, Arkansas, Oklahoma, Alabama, Mississippi, and Louisiana were the bottom 10.\(^{36}\) Although there were differences in terms of indicators and methodology utilized, which can account for differences in state order, we noted substantial overlap between America’s Health Rankings state ranks and the ranks based on the national percentile score application (see Table 2 for a sample of this comparison). Results of 2 Spearman rank correlations indicated a strong positive correlation between America’s Health Rankings state rankings and the state rankings based on the current application for Health Outcomes (\(\rho = 0.91, p < 0.001\)) and Health Factors (\(\rho = 0.90, p < 0.001\)). Further, 7 of 10 top-ranked and 8 of 10 bottom-ranked states in America’s Health Rankings 2018 overlapped with our top 10 and bottom 10 states.

Although creating national ranks was not a novel concept, the utilization of national percentile scores for counties and inclusion of population weighting based on population size differentiated this application from that used by other organizations such as the CHR&R, Healthiest Communities Rankings, and America’s Health Rankings. These additional methodological considerations helped level the playing field when comparing counties while producing similar results to other ranking systems.

Limitations

Although there are benefits in utilizing this application of the CHR methodology and data, there also are limitations to consider and explore further. For example, approximately half of the distributions for each of the 35 indicators, which were used to create the Health Outcomes and Health Factors composites, violated the assumption of normality.\(^13\) We identified 992 outliers (ie, z-score of ± 3) across all 35 indicators, with driving alone to work having the greatest number of outliers (\(n = 55\)) and access to exercise opportunities and drinking water violations having no outliers. We did not transform these data prior to creating the initial set of z-scores in line with the CHR methodology.\(^2\) Z-scores cannot “normalize” existing skewed distributions. Rather than transform the initial indicators, we decided proceeded with the CHF’s approach as the analyses were for descriptive purposes—we did not assume statistical significance for z-scores with values of ± 1.96 (ie, equivalent to ± 2 standard deviations from the mean). Further, after this initial round of z-scores, we again relied on the initial CHR methodology and only truncated extreme scores (ie, scores beyond a z-score of ± 3) for counties with a population size of < 20,000. Those interested in the CHR data may consider transforming the original data prior to creating the first round of z-scores (eg, log and cube root transformations) and transforming across all counties rather than only for counties with < 20,000 in future analyses.\(^13\)

An additional consideration pertains to our approach to missing data. In total, there were 2173 (2%) missing values across all 35 indicators, with graduation rate having the greatest number of missing values (\(n = 470\)) there were no missing values for poor or fair health, poor physical health days, poor mental health days, adult obesity, adult smoking, physical activity, excessive drinking, some college, and social associations. Although we utilized mean imputation as in the CHR methodology (ie, entering a z-score of 0 for missing values), a z-score of 0 in the CHR methodology represented the state’s mean for an indicator, whereas a z-score of 0 in the current approach represented the national mean. Organizations and communities interested in utilizing this approach may decide whether to utilize the national mean or the state mean for missing values. Alternatively, those using the CHR data may want to explore other forms of handling missing data than state or national mean imputation (eg, sub-group mean imputation or regression estimation).\(^13\)
The CHR&R also noted limitations regarding data comparability across states due to state- and jurisdiction-level factors that may influence estimates for both Health Outcomes and Health Factors.\(^7\) For example, among Health Outcomes measures, 3 of 5 measures are state-level measures from the Behavioral Risk Factor Surveillance Survey (BRFSS). As underscored by the CHR&R team, the BRFSS states that “…SAEs are for county-level use within states and should not be aggregated to MSAs or other geographic areas across state lines,” (p. 3).\(^8\) Similarly, 6 of 30 measures for Health Factors are based on data collection methods or models with state-level effects. For example, the violent crimes measure is subject to the reporting norms of residents and law enforcement officers in states and jurisdictions. For high school graduation rates, the CHR&R warned that although there have been changes made on a national level to ensure comparable graduation rates across the US, there may still be variation in terms of cohort and graduate definitions among states. The CHR&R also suggested that differences in chlamydia screening patterns that may exist across states and health care systems may partially account for differences in rates of sexually transmitted infections. Further, for the adult obesity, food environment index, and physical inactivity indicators, the models used to derive estimates may overestimate differences in border counties. Although we do want to acknowledge the inclusion of state-level effects as a limitation, other ranking systems, including US News and World Report, have included state-level data for national comparisons (eg, the inclusion of high school graduation and third-grade reading proficiency rates in City Health Dashboard\(^9\)).

**CONCLUSION**

Since its initiation, organizations and communities have utilized the CHR to capture a community’s health status, help support policy changes and decision-making, track progress over the years, and identify contributing factors to various health issues.\(^1\) As a way of contributing to these positive steps in managing the health of our communities, we proposed a national percentile score application to the CHR methodology and data to examine the health of the 3000+ US counties. Through the creation of national percentile scores and the introduction of population-weighting using population size to the original CHR methodology, we can examine where the greatest needs and opportunities for improvement exist within the United States and can continue to work toward a Culture of Health on a national level. \(\checkmark\)

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**Authors’ Contributions**

Matthew C. Stiefel, MPA, MS, developed the original concept, oversaw the development of the methodology and drafting of the article, and contributed to the critical review of the final draft of the manuscript. Tasha Straszewski, PhD, MA, contributed to the data analyses, drafting and editing of the manuscript, and critical review of the final draft of the manuscript; she prepared the manuscript for submission. Jennifer C. Taylor, PhD, contributed to the development of the methodology, data analyses, and drafting and critical review of the final draft of the manuscript. Christina Huang, MHS, developed the first iteration of the national percentile methodology and participated in the critical review of the final draft of the manuscript. Jessica An, MPH, participated in the drafting and critical review of the final draft of the manuscript. Folasade J. Wilson-Ekimududu, MPH, contributed to the data analyses and participated in the critical review of the final draft of the manuscript. Allen Cheadle, PhD, participated in the conceptualization and drafting of the article.

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**References**

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