

This is an unapproved work product of NCHRP project 22-47 provided for the sole use of proposers to respond to the RFP for NCHRP 22-47A and submit a proposal. Any unauthorized use, disclosure, copying, alteration, and dissemination or distribution is strictly prohibited.

Exploring the County Health Ranking Data from University of Wisconsin  
Population Health Institute for Inclusion in Crash-Based Safety  
Performance Functions

NCHRP 22-47: Incorporating Driver Behavior and Characteristics into Safety  
Prediction Methods

October 2021

## Background

The University of Wisconsin Population Health Institute measures the health of nearly all United States counties and ranks them within their respective States. The County Health Ranking is based on a composite of many factors using county-level data from National and State-based data resources. Figure 1 provides an overview of how the county health ranking model works. The model generates separate scores for Health Outcomes (weighted by 50 percent by length of life and 50 percent by quality of life) and Health Factors (weighted 30 percent by Health Behaviors, 20 percent by Clinical Care, 40 percent by Social and Economic Factors, and 10 percent by Physical Environment). The scores generated for each of these outcomes are based on regression models describing the impacts of each input variable on the outcome parameter.

The county health rankings themselves, are a single score provided for each county and ranked based on the individual county's value, the average value for counties in the State, and the standard deviation of counties in the State. The values for each measure are aggregated and weighted for a composite score. Lower scores indicate better health and higher scores indicate poorer health.

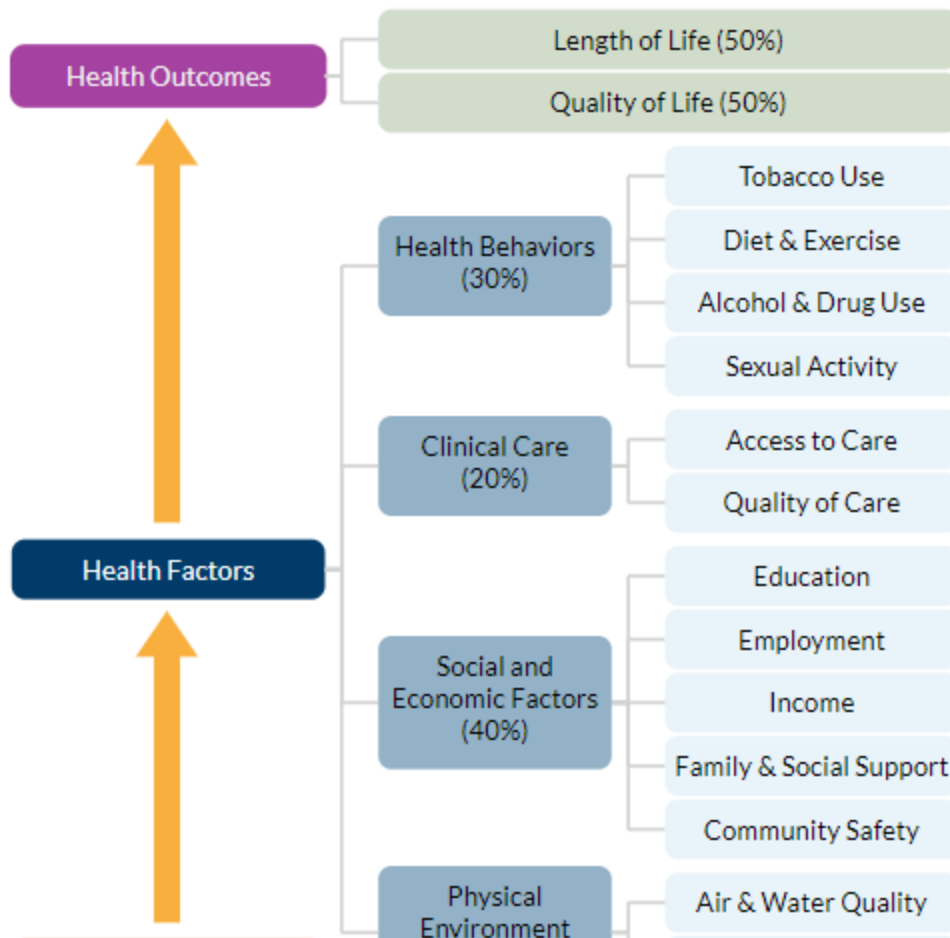


Figure 1. County Health Ranking Model.

In general, it seems the composite scores and generated z-values for each measure would provide little value overall to crash-based predictive modeling. However, some of the individual inputs could provide key insights into behaviors and socio-demographic characteristics associated with crash and severe crash outcomes.

The raw data provided by the University of Wisconsin for each individual measure are compiled from raw data sources. Due to reliability, uncertainty, missing values, and differences between States, the raw data are adjusted by the County Health Rankings team. Data reliability are generally a concern for smaller counties with smaller populations from which the data are drawn. For counties with small sample sizes for a given measure, the state average is used for the missing measures. Age-adjustment is also used for some measures to increase the comparability of health measures between counties.

The following lists provide measures used to support the model given in Figure 1. A definition is provided for those variables that are not self-explanatory. Further, the list provides an indication of the year(s) data were drawn from and the original data source used by the County Health Ranking team. These resources could be used directly for measures of interest by the project team.

### **Demographics**

1. Population. Available in 2019. Data come from Census Population Estimates.
2. Percent below 18 years of age. Available in 2019. Data come from Census Population Estimates.
3. Percent 65 and older. Available in 2019. Data come from Census Population Estimates.
4. Percent non-hispanic black. Available in 2019. Data come from Census Population Estimates.
5. Percent American Indian and Alaska native. Available in 2019. Data come from Census Population Estimates.
6. Percent Asian. Available in 2019. Data come from Census Population Estimates.
7. Percent native Hawaiian or other pacific islander. Available in 2019. Data come from Census Population Estimates.
8. Percent Hispanic. Available in 2019. Data come from Census Population Estimates.
9. Percent Non-hispanic white. Available in 2019. Data come from Census Population Estimates.
10. Percent not proficient in English. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
11. Percent females. Available in 2019. Data come from Census Population Estimates.
12. Percent rural. Available in 2019. Data come from Census Population Estimates.

### **Housing and Transit**

1. Severe housing problems. Percentage of households with at least 1 of 4 housing problems: overcrowding, high housing cost, lack of kitchen facilities, or lack of plumbing facilities. Available 2013- 2017. Data come from U.S. Department of Housing and Urban Development Comprehensive Housing Affordability Strategy (CHAS) data.
2. Driving alone to work. Percentage of the workforce that drives alone to work. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
3. Long commute driving alone. Among workers who commute in their car alone, the percentage that commute more than 30 minutes. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.

4. Traffic volume. Average traffic volume per meter of major roadways in the county. Available 2019. Data come from the Environmental Protection Agency Environmental Justice Mapping and Screening Tool.
5. Homeownership. Percentage of occupied housing units that are owned. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
6. Severe housing cost burden. Percentage of households that spend 50% or more of their household income on housing. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
7. Broadband access. Percentage of households with broadband internet connection. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.

### **Air and Water Quality**

1. Air pollution-particulate matter. Average daily density of fine particulate matter in micrograms per cubic meter. Available 2016. Data come from the CDC's National Environmental Public Health Tracking Network.
2. Drinking water violations. Indicator for the presence of health-related drinking water violations. 'Yes' indicates the presence of a violation, 'No' indicates no violation. Available 2019. Data come from the EPA's Safety Drinking Water Information System.

### **Community Safety**

1. Violent crime rate. Number of reported violent crime offenses per 100,000 population. Available 2014 and 2016. Data come from the FBI Uniform Crime Reporting Program (County-Level Detailed Arrest and Offense Data report).
2. Injury deaths. Number of deaths due to injury per 100,000 population. Available 2015 – 2019. Data come from the National Center for Health Statistics (NCHS) from the National Vital Statistics System (NVSS).
3. Homicides. Number of deaths due to homicide per 100,000 population. Available 2013 – 2019. Data come from the NCHS from the NVSS.
4. Suicides. Number of deaths due to suicide per 100,000 population. Available 2015 – 2019. Data come from the NCHS from the NVSS.
5. Firearm fatalities. Number of deaths due to firearms per 100,000 population. Available 2015 – 2019. Data come from the NCHS from the NVSS.
6. Juvenile arrests. Rate of delinquency cases per 1,000 juveniles. Available 2018. Data come from the Easy Access to State and County Juvenile Court Case Counts (EZACO).

### **Family and Social Support Measures**

1. Children in single-parent households. Percentage of children that live in a household headed by single parent. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
2. Social associations. Number of membership associations per 10,000 population. Available 2018. Data come from County Business Patterns.
3. Residential segregation – black/white. Index of dissimilarity where higher values indicate greater residential segregation between Black and White county residents. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.

4. Residential segregation – non-white/white. Index of dissimilarity where higher values indicate greater residential segregation between non-White and White county residents. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.

### **Income**

1. Children in poverty. Percentage of people under 18 in poverty. Available 2019. Data come from the US Census Bureau from the Small Area Income and Poverty Estimates.
2. Income inequality. Ratio of household income at the 80<sup>th</sup> percentile to income at the 20<sup>th</sup> percentile. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
3. Median household income. The income where half of households in a county earn more and half of households earn less. Available 2019. Data come from the US Census Bureau from the Small Area Income and Poverty Estimates.
4. Children eligible for free or reduced price lunch. Percentage of children enrolled in public schools that are eligible for free or reduced price lunch. Available 2018 – 2019. Data come from the National Center for Education Statistics.

### **Employment**

1. Unemployment. Percentage of population ages 16 and older unemployed but seeking work. Available 2019. Data come from the local area unemployment statistics program of the Bureau of Labor Statistics.

### **Education**

1. High school completion. Percentage of adults ages 25 and over with a high school diploma or equivalent. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
2. Some college. Percentage of adults ages 25 – 44 with some post-secondary education. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
3. High school graduation. Percentage of ninth-grade cohort that graduates in four years. Available 2017 – 2018. Data come from EDFacts.
4. Disconnected youth. Percentage of teens and young adults ages 16 – 19 who are neither working nor in school. Available 2015 – 2019. Data come from the American Community Survey, 5-year estimates.
5. Reading scores. Average grade level performance for 3<sup>rd</sup> graders on English Language Arts standardized tests. Available 2018. Data come from the Stanford Education Data Archive.
6. Math scores. Average grade level performance for 3<sup>rd</sup> graders on math standardized tests. Available 2018. Data come from the Stanford Education Data Archive.

### **Quality of Care**

1. Preventable hospital stays. Rate of hospital stays for ambulatory-care sensitive conditions per 100,000 Medicare enrollees. Available 2018. Data come from the Centers for Medicare and Medicaid Services Office of Minority Health's Mapping Medicare Disparities.

2. Mammography screening. Percentage of female Medicare enrollees ages 65-74 that received an annual mammography screening. Available 2018. Data come from the Centers for Medicare and Medicaid Services Office of Minority Health's Mapping Medicare Disparities.
3. Flu vaccinations. Percentage of fee-for-service (FFS) Medicare enrollees that had an annual flu vaccination. Available 2018. Data come from the Centers for Medicare and Medicaid Services Office of Minority Health's Mapping Medicare Disparities.

### **Access to Care Services**

1. Uninsured. Percentage of population under age 65 without health insurance. Available 2018. Data come from US Census Bureau's Small Area Health Insurance Estimates.
2. Primary care physicians. Ratio of population to primary care physicians. Available 2018. Data come from the Area Health Resource Files which is a collection of data from more than 50 sources.
3. Dentists. Ratio of population to dentists. Available 2019. Data come from the Area Health Resource Files which is a collection of data from more than 50 sources.
4. Mental health providers. Ratio of population to mental health providers. Available 2020. Data come from the National Provider Identification's National Plan and Provider Enumeration System.
5. Uninsured adults. Percentage of adults under age 65 without health insurance. Available 2018. Data come from the US Census Bureau's Small Area Health Insurance Estimates program.
6. Uninsured children. Percentage of children under age 19 without health insurance. Available 2018. Data come from the US Census Bureau's Small Area Health Insurance Estimates program.
7. Other primary care providers. Ratio of population to primary care providers other than physicians. Available 2020. Data come from the National Provider Identification's National Plan and Provider Enumeration System.

### **Sexual Activity Measures**

1. Sexually transmitted infections. Number of newly diagnosed chlamydia cases per 100,000 population. Available 2018. Data come from the National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention.
2. Teen births. Number of births per 1,000 female population ages 15-19. Available 2013 – 2019. Data come from the NCHS from the NVSS.

### **Alcohol and Drug Use**

1. Excessive drinking. Percentage of adults reporting binge or heavy drinking. Available 2018. Data come from the Behavioral Risk Factor Surveillance System.
2. Alcohol-impaired driving deaths. Percentage of driving deaths with alcohol involvement. Available 2015 – 2019. Data come from the Fatality Analysis Reporting system.
3. Drug overdose deaths. Number of drug poisoning deaths per 100,000 population. Available 2017 – 2019. Data come from the NCHS from the NVSS.
4. Motor vehicle crash deaths. Number of motor vehicle crash deaths per 100,000 population. Available 2013 – 2019. Data come from the NCHS from the NVSS.

### **Diet and Exercise**

1. Adult obesity. Percentage of the adult population (age 20 and older) that reports a body mass index greater than or equal to 30kg/m<sup>2</sup>. Available 2017. Data available from the US Diabetes Surveillance System.
2. Food environment index. Index of factors that contribute to a healthy food environment, from 0 (worst) to 10 (best). Available 2015 and 2018. Data available from the USDA's Atlas.
3. Physical inactivity. Percentage of adults age 20 and over reporting no leisure-time physical activity. Available 2017. Data available from the US Diabetes Surveillance System.
4. Access to exercise opportunities. Percentage of population with adequate access to locations for physical activity. Available 2010 and 2019. Data come from Business Analyst, Delorme map data, Esri, and US Census Tigerline Files.
5. Food insecurity. Percentage of population who lack adequate access to food. Available 2018. Data come from the Feed America Map the Meal Gap.
6. Limited access to healthy foods. Percentage of population who are low-income and do not live close to a grocery store. Available 2015. Data available from the USDA's Atlas.

### **Tobacco Use**

5. Adult smoking. Percentage of adults who are current smokers. Available 2018. Data come from the Behavioral Risk Factor Surveillance System.

### **Quality of Life**

6. Poor or fair health. Percentage of adults reporting fair or poor health (age-adjusted). Available 2018. Data come from the Behavioral Risk Factor Surveillance System.
1. Poor physical health days. Average number of physically unhealthy days reported in past 30 days (age-adjusted). Available 2018. Data come from the Behavioral Risk Factor Surveillance System.
2. Poor mental health days. Average number of mentally unhealthy days reported in past 30 days (age-adjusted). Available 2018. Data come from the Behavioral Risk Factor Surveillance System.
3. Low birthweight. Percentage of live births with low birthweight (< 2,500 grams). Available 2013 – 2019. Data come from the NCHS from the NVSS.
4. Frequent physical distress. Percentage of adults reporting 14 or more days of poor physical health per month. Available 2018. Data come from the Behavioral Risk Factor Surveillance System.
5. Frequent mental distress. Percentage of adults reporting 14 or more days of poor mental health per month. Available 2018. Data come from the Behavioral Risk Factor Surveillance System.
7. Diabetes. Percentage of adults aged 20 and above with diagnosed diabetes. Available 2017. Data available from the US Diabetes Surveillance System.
6. HIV prevalence. Number of people aged 13 years and older living with a diagnosis of HIV infection per 100,000 population. Available 2018. Data come from the National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention.

### **Length of Life Measures**

1. Premature death. Years of potential life lost before age 75 per 100,000 population (age-adjusted). Available 2017 – 2019. Data come from the NCHS from the NVSS.

This is an unapproved work product of NCHRP project 22-47 provided for the sole use of proposers to respond to the RFP for NCHRP 22-47A and submit a proposal. Any unauthorized use, disclosure, copying, alteration, and dissemination or distribution is strictly prohibited.

2. Life expectancy. Average number of years a person can expect to live. Available 2017 – 2019. Data come from the NCHS from the NVSS.
3. Premature age-adjusted mortality. Number of deaths among residents under age 75 per 100,000 population (age-adjusted). Available 2017 – 2019. Data come from the NCHS from the NVSS.
4. Child mortality. Number of deaths among children under age 18 per 100,000 population. Available 2016 – 2019. Data come from the NCHS from the NVSS.
5. Infant mortality. Number of all infant deaths (within 1 year) per 1,000 live births. Available 2013 – 2019. Data come from the NCHS from the NVSS.