



A Rural Socioeconomic Vulnerability and Resiliency Index and Associated Health Outcomes

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EXECUTIVE SUMMARY

Purpose: This study creates an index of social and economic variables that are related to population health outcomes among rural and urban U.S. counties, and examines variability in this index across rural and urban counties.

Methods: Data sources, including the Area Resource File (ARF), Economic Research Service, U.S. Census, and Death Certificate data from the National Center for Health Statistics, were used to construct the Vulnerability and Resiliency Index (VRI), a county measure containing both socioeconomic strengths and weaknesses. The VRI is found by ranking six socioeconomic indicators across counties in the U.S. The variables used to generate the VRI are unemployment variability over time, social capital, percent of persons living in poverty, persons aged 25 and older who have completed 4 or more years of college, percent employed in white collar occupations, and the percent of the population living in urban areas (the last a measure distinct from rural or urban county classification). VRI scores are examined across USDA rural-urban county-level continuum codes. Both descriptive and correlational analyses were conducted to assess the association between VRI and health outcomes using age-adjusted death rates for major causes of death (heart disease, all-site cancers, and stroke).

Findings: VRI scores on average were worse in more rural settings. Worse VRI scores are concentrated in rural areas of the Southeast, Appalachia, and some parts of the West. Better VRI scores were associated with better health outcomes (lower heart disease, cancer, and stroke death rates) across the rural-urban continuum.

Conclusions: These analyses provide evidence to support the development of programs and policies that foster educational development, and economic diversity and vitality, as means of public health improvement, especially in rural areas in selected regions of the country.

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BACKGROUND

This study examines the role of six socioeconomic conditions in shaping the health outcome landscape in the U.S. across the rural and urban continuum. There is growing awareness in the public health community that health is linked to social and economic features of people's environments in addition to individual risks.¹ Socioeconomic variables are among the strongest predictors of health outcomes.²⁻⁵ However, strong associations between socioeconomic status (SES) and health outcomes may not be uniform for all populations defined by geography, ethnicity, gender or age. Potential health risks related to socioeconomic conditions of local areas may be mediated by a number of factors including economic diversity and resiliency in times of economic downturns.^{6,7}

An index was derived from six component variables that reflects collective socioeconomic strengths and weaknesses of U.S. counties. This Vulnerability and Resiliency Index (VRI) quantifies the level of exposure to a set of social and economic strengths and weaknesses. Vulnerabilities (e.g., greater unemployment variability over time) refers to conditions that are expected to make populations more susceptible to health problems, and resiliencies (e.g., higher social capital) refers to health protective features. The purposes of the study were to construct the VRI, to examine its variability across U.S. regions, and rural and urban settings, and to test its associations with population health outcomes. The rationale behind the VRI construction is to 1) combine multiple social and economic measures into one index and 2) recognize not only potential threats to health (e.g., poverty rates) but also potential protective factors (e.g., higher education levels).

METHODS

Data were processed and collated from a number of secondary sources to create a database representing key socioeconomic indicators for every county in the U.S. Data sources included the Area Resource File (ARF), Economic Research Service, U.S. Census, and Death Certificate data from the National Center for Health Statistics. The Vulnerability and Resiliency Index (VRI) was constructed by ranking six socioeconomic indicators among 3,074 counties in the coterminous U.S. The six variables used to generate the VRI were selected based on previously established indicators known to relate to population health as individual measures.¹⁻⁷

The six measures were:

Unemployment Variability

Variability in unemployment rates was calculated as the standard deviation of annual unemployment rates over the period 1990-2007. A greater standard deviation indicates more variability; high variability in unemployment rates is used as an indicator of economic vulnerability. The hypothesis is that greater variability contributes to stress and economic difficulties and thus increases risks of poor health outcomes.

Social Capital Index

An Index measuring 'Social Capital' was constructed by a group of researchers at Penn State University.⁸ Social Capital reflects the degree of social cohesion, trust and reciprocity among a population, and has been shown to predict population health outcomes such as mortality rates. The proposition in this study is that high levels of social capital lowers vulnerability and increases resiliency to adverse health effects of economic crisis.

Percent of Person Living in Poverty

Data on the percent of persons living in poverty were obtained from the Area Resource File.¹⁰ High levels of poverty are indicative of high vulnerability and low resiliency.⁴

Percent of Persons 25 years and Older who have Completed 4 or more years of College

High levels of educational attainment reflect high levels of economic vitality, and therefore high resiliency.⁵ Data on the percent of persons with 4 years of college were obtained from the Area Resource File.¹⁰

Percent of Persons Employed in White Collar Occupations

Occupational structure has also been related to health outcomes.¹¹ For this analysis the percent employed in white collar occupations was used to indicate occupations typically associated with higher income and benefits and therefore reduced vulnerability. Data on white collar employment were obtained from the Area Resource File.¹⁰

Percent of Population Living in Urban Areas

Even among rural counties, settlement patterns vary across the U.S. Many counties classified as metropolitan by one coding system may have significant populations living in rural areas. Others with small total populations and rural designations may have their populations living in a few concentrated areas. The percent of the population living in urban areas is used to aid in differentiating between settlement pattern types. Data on the percent of persons living in urban areas were obtained from the Area Resource File.¹⁰ Counties with high percentages of people living in urban areas are viewed in this study as counties with lower vulnerability.

Construction of the VRI

The equation of the VRI for a given county is:

$$VRI = \sum (X_i / X_m) \tag{1}$$

Where X_i refers to the score for the i th county on the X th variable, and the X_m refers to the mean national value of that X th variable. The six X variables are the six components to the VRI.

Thus, each of the component variables was calculated as a proportion to its mean value. For example, if a county had a college education level equal to the national mean, the county's score for that component would be 1; a score 20% higher than the national mean would be 1.2, etc. Values for Unemployment Variability and Percent Living in Poverty were reverse scored to reflect their expected inverse association with health outcomes. Each score was then summed to derive the overall VRI index score for each county. High values of the VRI reflect high resiliency and low vulnerability, and low VRI scores reflect low resiliency and high vulnerability. (I.e., a higher VRI is "better."). The geographic distribution of VRI scores is shown in Figure 1.

Analyses

Counties were classified using the rural-urban continuum codes developed by the USDA/Economic Research Service.¹⁰ (See Table 1). Rural-urban continuum codes provide a 9-part classification scheme that distinguishes metropolitan (metro) counties by the population size of their metro area, and nonmetropolitan (non-metro) counties by degree of urbanization and adjacency to a metro area or areas. Completely rural counties are those with either no urban populations or urban populations of less than 2,500.

Descriptive statistics were calculated to describe study variables. Then, linear multiple regression analyses were conducted to assess whether the VRI was significantly associated with health outcomes as measured by age-adjusted death rates for major causes of death (heart disease, all-site cancers, and stroke).

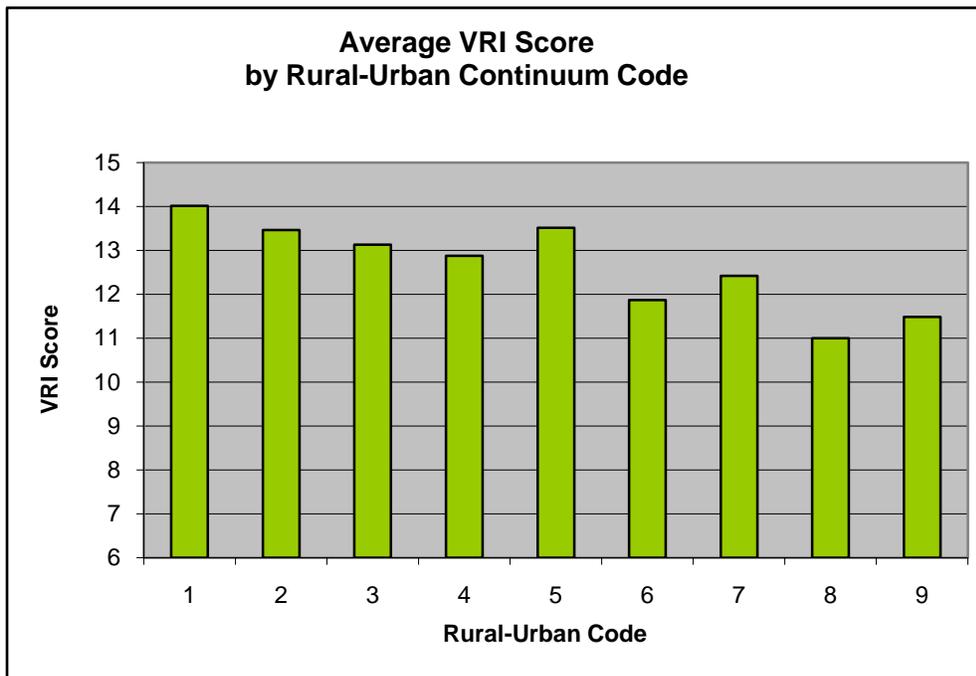
Table 1: Rural-Urban Continuum Code Descriptions.

Rural-Urban Continuum Code	Description
1	County in metro area with 1 million population or more
2	County in metro area of 250,000 to 1 million population
3	County in metro area of fewer than 250,000 population
4	Nonmetro county with urban population of 20,000 or more, adjacent to a metro area
5	Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area
6	Nonmetro county with urban population of 2,500-19,999, adjacent to a metro area
7	Nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area
8	Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area
9	Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro area

FINDINGS

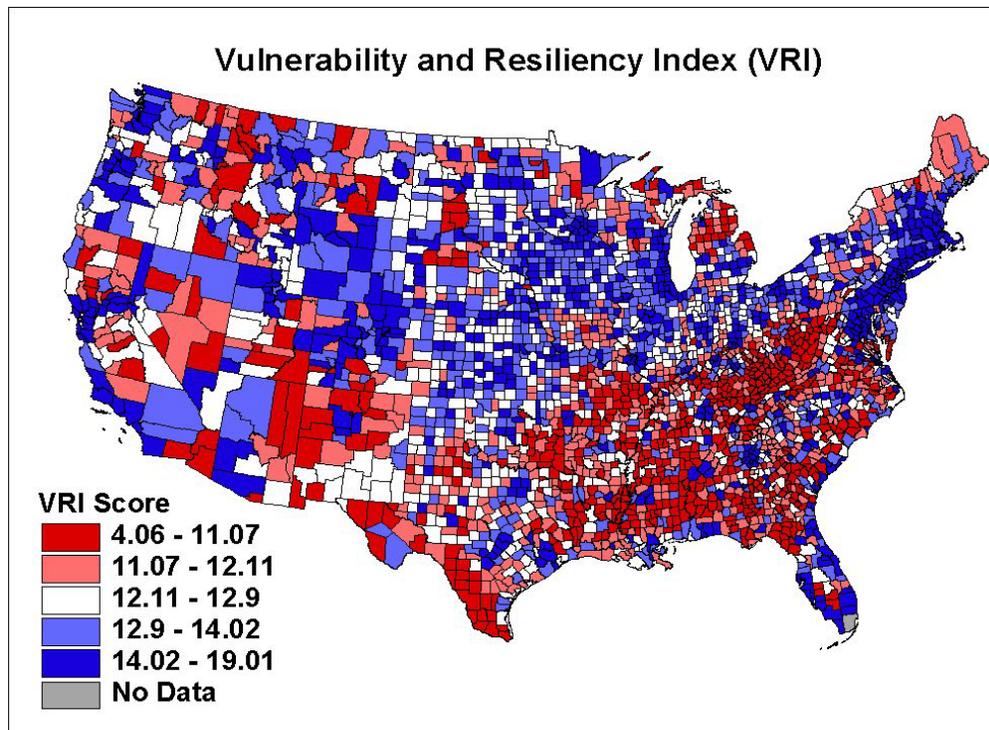
Along the rural-urban continuum, counties towards the rural end of the continuum had on average poorer VRI scores than more urban counties (see Figure 1).

Figure 1: Average Vulnerability and Resiliency Index Score by Rural-Urban Continuum Code



VRI scores were generally lower in the Southeast, central Appalachia, and in some nonmetropolitan areas in the West (Figure 2). However, there were also non-metropolitan areas, primarily in the Midwest and West, with higher VRI scores.

Figure 2: County Distribution, Vulnerability and Resiliency Index



Regression results showed that a better VRI score was significantly associated with lower death rates for all three health outcomes. VRI was also significantly related to mortality rates for all rural-urban continuum codes (see the Full Report of this study for greater details).

CONCLUSIONS

Rural areas in general had less favorable VRI scores. Some rural areas have characteristics that may render their populations vulnerable to high risk of chronic diseases. High rates of poverty, undiversified economies, and low levels of educational attainment contribute to increased risk of poor chronic disease outcomes. However, there are also regional variations, and other rural areas have positive health outcomes relative to metropolitan areas.

In this study, a number of factors were hypothesized to contribute to population health outcome disparities among counties in the U.S. No one socioeconomic factor is adequate to explain variability in health outcomes, and this study derived a Vulnerability and Resiliency Index (VRI) which combined multiple socioeconomic factors. In addition, unemployment variability, a new indicator which has not yet been examined in relation to health outcomes was included to help assess health outcomes.

From a policy perspective, the findings underscore the need for policies to improve population health by addressing fundamental determinates of health related to socioeconomic conditions. The variability in VRI scores across parts of the country may be useful to understand where these efforts should be concentrated, including some rural areas in the Southeast, Central Appalachia, and the West. Programs and policies may include such initiatives as tax incentives to rural businesses to support hiring, investments in adult retraining

programs, or programs to support high school retention efforts and college loan or scholarship programs for rural populations.

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Additional Information

See the Full Report that corresponds to this Brief for more detailed methods and findings from this study at: http://wvrhrc.hsc.wvu.edu/docs/2009_halverson_final_report.pdf