



Article

Regional variation in the predictive validity of self-rated health for mortality

Edward R. Berchick^{a,*}, Scott M. Lynch^{a,b}^a Duke University Population Research Institute, Duke University, Box 90989, Durham, NC 27708, USA^b Department of Sociology, Duke University, Box 90088, Durham, NC 27708, USA

A B S T R A C T

Self-rated health (SRH) is a commonly used measure for assessing general health in surveys in the United States. However, individuals from different parts of the United States may vary in how they assess their health. Geographic differences in health care access and in the prevalence of illnesses may make it difficult to discern true regional differences in health when using SRH as a health measure. In this article, we use data from the 1986 and 1989–2006 National Health Interview Survey Linked Mortality Files and estimate Cox regression models to examine whether the relationship between SRH and five-year all-cause mortality differs by Census region. Contrary to hypotheses, there is no evidence of regional variation in the predictive validity of SRH for mortality. At all levels of SRH, and for both non-Hispanic white and non-Hispanic black respondents, SRH is equally and strongly associated with five-year mortality across regions. Our results suggest that differences in SRH across regions are not solely due to differences in how respondents assess their health across regions, but reflect true differences in health. Future research can, therefore, employ this common measure to investigate the geographic patterning of health in the United States.

1. Introduction

Self-rated health (SRH) is a valuable and commonly used measure for documenting health patterns in the United States. This single question asks respondents: “Would you say your own health, in general, is excellent, very good, good, fair, or poor?” Despite its simplicity, SRH is a powerful measure that permits individuals to evaluate multiple dimensions of their well-being simultaneously (Fayers & Sprangers, 2002; Schnittker, 2005). It also has strong “predictive validity”: people with worse SRH have higher short-term mortality rates compared to those who rate their health more highly (Idler & Benyamini, 1997; Jylhä, 2009). Although SRH is predictive of mortality and other physical health outcomes on average and in a diverse set of populations (Jylhä, 2009), a growing body of research has questioned whether the association between SRH status and mortality systematically differs across social and demographic groups (e.g., Dowd & Zajacova, 2007; Helweg-Larsen et al., 2003; Huisman, van Lenthe, & Mackenbach, 2007).

SRH's predictive validity also may vary across regions of the country. Manderbacka, Kareholt, Martikainen, & Lundberg (2003) argue that SRH reporting is comprised of two distinct components: (i) assembling and assessing information about one's health (*health assessment*), and (ii) evaluating this information by comparing it to a particular reference group (*reference group selection*). Regional differ-

ences in overall levels of health, in access to health care, and in access to health information likely contribute to regional variation in the way people endorse SRH categories and, therefore, may lead to regional differences in health assessment and reference group selection.

Regional variation in health care access may affect whether individuals receive diagnoses and whether they have the information necessary to assess their health accurately (*health assessment*). SRH in regions with better health care access and utilization may, therefore, have higher predictive validity than SRH in other regions. For example, individuals who live in the South are less likely to access medical care than those who live elsewhere in the United States (Lanksa & Kryscio, 1994) and are less likely to have health insurance (Barnett & Vornovitsky, 2016). Southerners' SRH may therefore be less correlated with their health conditions and risk of mortality than other Americans' SRH, because Southerners may have comparatively less health information on which to base their assessment.

There is also likely variation in *reference group selection* by region. In endorsing a SRH category, individuals consider the health of their peers (e.g., those of a similar age, sex, race/ethnicity) (Jylhä, 2009; Manderbacka et al., 2003). Peers are also likely geographically proximate to them, and regions differ in the prevalence of health conditions and disability, and incidence of mortality (e.g., Glymour et al., 2009; Pickle, Mungiole, & Gillum, 1997; Porell & Miltiades, 2002; Zopf, 1992). In regions with high disease prevalence, a less-healthy compar-

* Corresponding author.

E-mail addresses: edward.berchick@gmail.com (E.R. Berchick), scott.lynch@duke.edu (S.M. Lynch).

ison group could also cause individuals to be more discriminating in health ratings (i.e. less likely to endorse the worst categories), thereby increasing predictive validity and biasing estimates regional health differences obtained with the subjective measure.

To our knowledge there is no research investigating whether the association between SRH and mortality differs across regions in the United States. Yet the question of regional variation in the mortality predictive validity of SRH is a central one. If the relationship between SRH and mortality varies by region, conclusions drawn about patterns in physical and/or mental health from patterns in SRH may be distorted (Delpierre et al., 2009).

Therefore, we seek to understand whether there is evidence of regional variation in the predictive validity of SRH health for mortality. Given regional variation in racial disparities in health status and health care status, we pay particular attention to racial differences in reported health and mortality in our analyses.

2. Materials and methods

2.1. Study population and sample design

Our analyses use data from the 1986 and 1989–2006 waves of the National Health Interview Survey (NHIS). The NHIS is an annual, repeated cross-sectional survey that, through the use of survey weights, is representative of the health of the non-institutionalized, civilian U.S. adult population (see NCHS (2014) for additional detail about sample design). Each year, respondents from approximately 45,000 households are selected by multi-stage stratified random sampling and report their health status and conditions as well as key social and demographic characteristics.

Mortality data come from the NHIS Linked Mortality Files (NHIS-LMF). NHIS-LMF use a probabilistic algorithm to match 1986–2010 NHIS respondents to available death records through December 31, 2011 (NCHS, 2015). Matching is based on a dozen items in both data sources, including name, date of birth, state of residence, and social security numbers, that fall into seven combinations. Records with one of the necessary combinations of identifiers are then given a score based on the level of match, with positive weights given to identifiers that correspond between the NHIS and NDI and negative weights given to identifiers that do not correspond. Estimates from the NHANES I Epidemiological Follow-Up Study are then used to determine match thresholds (see NCHS (2015) for greater detail).

Because some of our primary variables were not collected in 1987 and 1988, we do not include data from those waves. NHIS and NHIS-LMF data for the current analyses were obtained through the University of Minnesota's Integrated Health Interview Series (IHIS) (Minnesota Population Center and State Health Access Data Assistance Center, 2015).

The analyses we present are restricted to non-Hispanic white and black respondents who were not missing information for any of the primary variables of interest. Given our disaggregation by health category and region, there are not large enough subsamples of Hispanics to produce stable estimates. The Midwest, for example, contained 3022 Hispanics (after sample restriction), only 181 of whom were in "poor" health. Approximately 5.7% of the sample was missing some data, primarily on health insurance (4.4% of the sample). Results are nonetheless robust to multiple imputation. To examine five-year mortality, we only include individuals interviewed in 2006 or earlier. Given the relative rarity of mortality among individuals 45 years and younger and an open-ended age interval for those 85 and older, we focus on mortality among 45–84 year olds. This exclusion strategy leaves us with a sample of 522,202 individuals.

2.2. Primary variables

SRH is a five-category measure in which respondents were asked to

rate their health as excellent, very good, good, fair, or poor. We treat these response categories as nominal. In line with recent work that hypothesizes that the parameterization of SRH may obscure reporting heterogeneity (Assari, Lankarani, & Burgard, 2016), we also ensured that all presented results were robust to continuous (0–4) and dichotomous (fair/poor vs. good or better) specifications.

Region is measured using the four-category Census measure: Northeast, Midwest, South, and West. Each region contains between nine and sixteen states, grouped based on geography, economic systems, population composition, and historical development (Montez & Berkman, 2014; U.S. Census Bureau, 1994).

Analyses focus on five-year all-cause mortality to ensure sufficient sample sizes for each region. As a test of robustness, we also examined regional variation in the association between SRH and one-, three-, and ten-year mortality. These additional analyses yielded substantively similar conclusions to those obtained using five-year mortality and are not presented.

Our analyses include a small number of covariates to capture health assessment and reference group selection. Education might affect the rating of one's own health and the selection of one's reference group. Education is measured as a four-category measure: less than high school, high school, some college, and college or more. Health insurance serves as a proxy for access to medical care; having access to care could increase the information individuals have in endorsing a SRH category. Health insurance is measured as an indicator of whether an individual has any health insurance coverage. Activity limitation, which serves a proxy for prevailing levels of physical health and contributes to health assessment, is measured by an indicator of whether an individual is limited in any way at the time of the survey. We also calculated the sex-by-race-specific proportion in each region in each survey year with any activity limitation and with health insurance coverage, as well as the proportion reporting each SRH status in order to capture prevailing differences in the health of individuals' reference group.

2.3. Analysis

We use Cox proportional hazards models to estimate the association between SRH and five-year mortality. However, results are robust to other approaches, such as discrete time logit with a Gompertz baseline hazard. In all models, we controlled on an individual's age at the time of NHIS interview to account for well-documented age differences in mortality (Zajacova & Woo, 2016), as well as potential cohort differences. Models were estimated separately by race (non-Hispanic white, non-Hispanic black) and are weighted. Our sample included 391,284 non-Hispanic whites and 62,175 non-Hispanic blacks.

Our initial models only control on sex, age, and year. We then introduce individual-level measures of education, activity limitations, and health insurance coverage, as well as the regional-level measures of the proportion of the year-sex-race-specific regional population with activity limitation or health insurance coverage and the proportion endorsing each SRH category. These variables partially account for differences in health assessment and reference group selection between geographic regions. As our research question hinges on how the introduction of educational attainment (and other covariates) affects the estimate SRH-by-region interactions, we do not present the results for each of the covariates.

3. Results

Table 1 presents the sample characteristics. Only a small fraction of the sample died within five years of interview, with higher mortality in the South (8.5%) compared to other regions (6.6–7.5%). The prevalence of poor SRH was also fairly similar across the Northeast, Midwest, and West (3.9–4.0%) but greater in the South (6.9%). That

Table 1
Demographic, health, and mortality characteristics of the sample, by region.

	Northeast (n=129,552)	Midwest (n=148,635)	South (n=223,042)	West (n=126,861)
Self-rated health (%)				
Excellent	22.8	21.2	20.0	24.7
Very good	31.3	31.5	27.9	30.0
Good	30.2	30.9	29.5	28.6
Fair	11.9	12.4	15.7	12.3
Poor	3.8	3.9	6.9	4.4
Age (yrs)	59.8	59.5	59.7	59.3
Female (%)	54.0	52.7	53.2	52.3
Nonwhite (%)	9.0	7.6	17.2	4.9
5-year mortality (%)	7.4	7.4	8.3	6.5
Activity limitation (%)	20.3	23.8	24.1	22.6
Insured (%)	94.3	94.2	89.7	90.6

Data: 1986–2006 NHIS-LMF.
Differences between regions for all variables are significant at the $p < 0.01$ level based on chi square (categorical) or ANOVA (continuous) tests.

is, Southerners had higher mortality and lower SRH than individuals from other regions. Differences in SRH and mortality between regions were each significant at the $p < 0.01$ level.

To examine whether there are regional differences in mortality predictive validity across SRH response categories, we included 19 health-by-region indicators, representing all possible health-by-region combinations (with excellent health in the South as the reference group). Given the large number of hazard ratios, we present our results graphically (Fig. 1). As shown in the figure, worse SRH is associated with greater mortality for both races. However, there were no significant differences in the predictive validity of SRH across geographic regions for either race.

Fig. 2 presents results from models in which we introduced individuals' education level, activity limitation, and health insurance coverage, as well as region-level measures of activity limitations, health insurance coverage, and SRH. As noted above, these additional covariates capture differences in health assessment and reference

group selection. Accounting for these differences does not reveal any substantially different patterns than the earlier models. The relationship between SRH and mortality is trending stronger among non-Hispanic whites in the South than in other areas, but there are no significant differences in the mortality predictive validity of SRH across geographic regions.

Most research limits measurement of region to the South versus all other regions, and it often limits measurement of SRH to fair/poor versus good or better SRH. Thus, we also estimated models in which we dichotomized both variables (Table 2). That is, we measure region with an indicator variable for South (vs. other) and SRH with an indicator for fair/poor (vs. good/very good/excellent). These additional models also offer no evidence that living in the South has any effect on the mortality predictive validity of SRH. For both Southerners and non-Southerners, rating one's health as fair or poor is associated with about three times greater mortality for whites and two times greater mortality for blacks.

We also performed additional tests to ensure that our model specification did not obscure any potential variation across regions. Neither exploratory models stratified by combinations of race, sex, and age nor models with alternative specifications of the hazard and the introduction of time-varying covariates suggested any regional differences in the predictive validity of SRH for mortality. Finally, we also introduced individual- and regional-level covariates separately rather than simultaneously to examine the possibility of countervailing effects (e.g., offsetting effects of regional differences in activity limitations and an individual's own health). These additional models did not suggest any significant predictive validity differences across regions.

4. Discussion and conclusion

4.1. Discussion

SRH is a workhorse measure in health research, in part due to its predictive validity—its association with objective health outcomes and subsequent mortality. The present analysis was motivated by research focusing on “reporting heterogeneity” that has documented differences in the relationship between SRH and mortality by sex (Dowd & Todd,

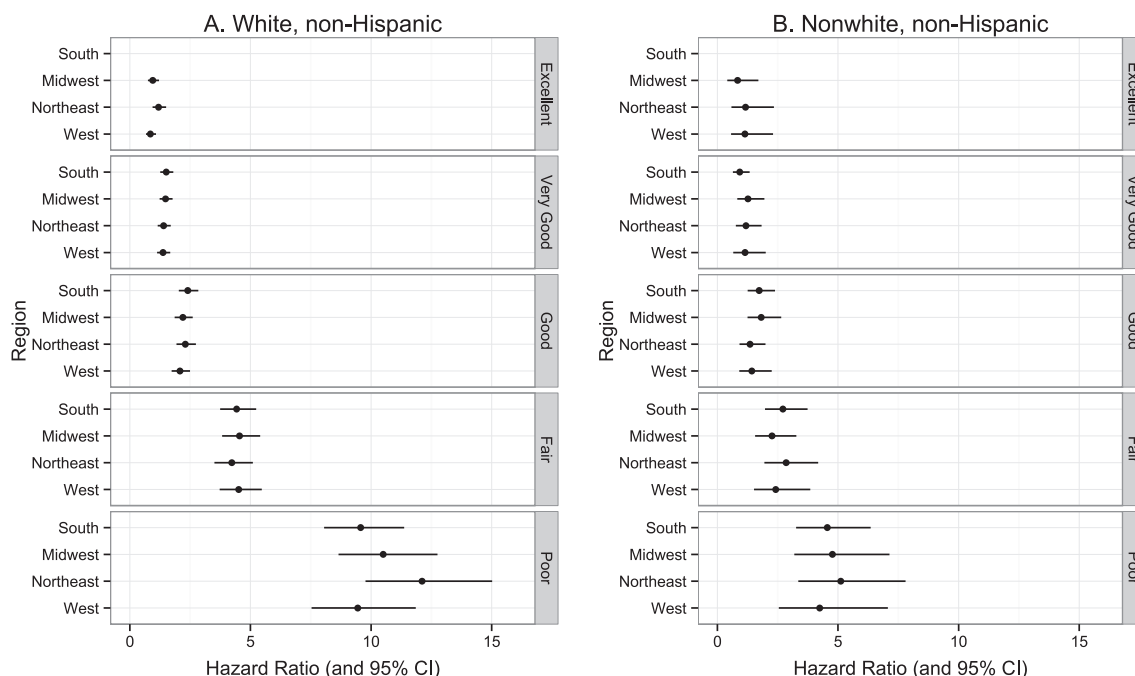


Fig. 1. Association between self-rated health and five-year mortality. Results from Cox models; adjusted for sex, survey year, and age at survey. $n=391,284$ for non-Hispanic whites and $n=62,175$ for non-Hispanic blacks, 1986–2006 NHIS-LMF.

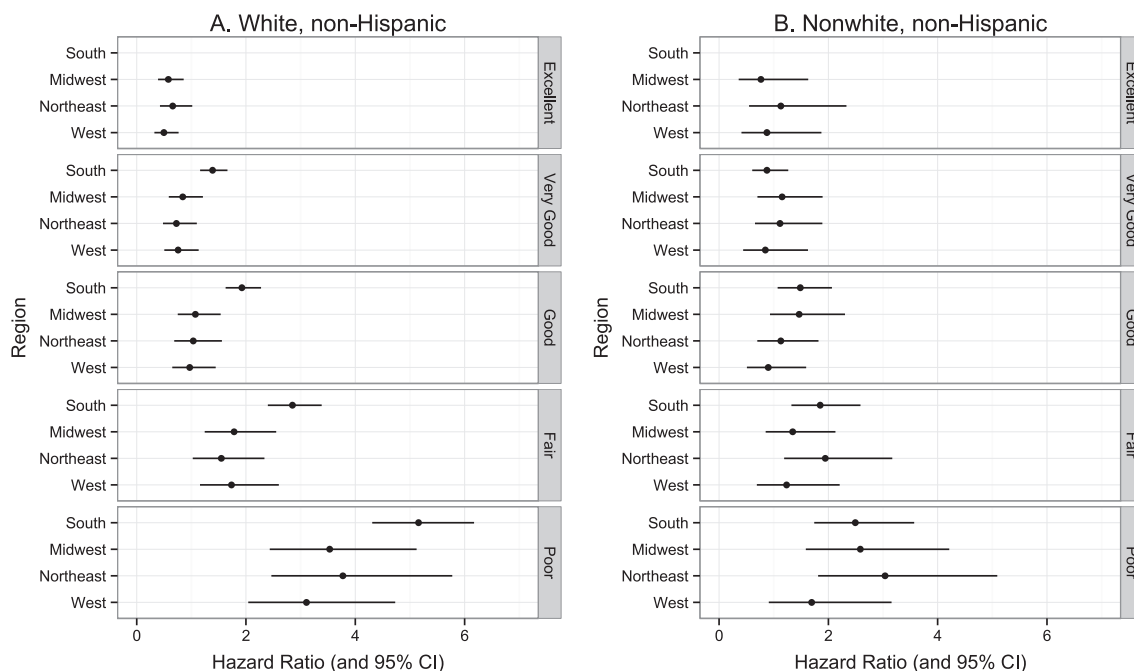


Fig. 2. Association between self-rated health and five-year mortality, adjusted for individual- and regional-level differences. Results from Cox proportional hazard models; adjusted for respondents’ sex, survey year, age at survey, activity limitation, and health insurance status and regions’ percent reporting each health status, activity limitation, and health insurance. $n=391,284$ for non-Hispanic whites and $n=62,175$ for non-Hispanic blacks 1986–2006 NHIS-LMF.

Table 2

Hazard ratios (and 95% confidence intervals) for five-year mortality by region and self-rated health, dichotomized variables.

	Non-Hispanic White ($n=391,284$)	Non-Hispanic Black ($n=62,175$)
South (ref: non-South)	1.06 [0.99, 1.13]	0.98 [0.84, 1.15]
Fair/Poor (ref: Good/Very Good/Excellent)	3.42 [3.21, 3.64]	2.21 [1.87, 2.62]
Fair/Poor x South	0.97 [0.88, 1.07]	1.08 [0.86, 1.35]

Results from Cox proportional hazards models; adjusted for sex, survey year, and age at survey. 1986–2006 NHIS-LMF.

2011), race/ethnicity (McGee et al., 1999), education (Dowd & Zajacova, 2007), and age (Helweg-Larsen et al., 2003; Schnittker, 2005). As with these other populations, differences in health assessment and reference group selection could lead to heterogeneous reporting patterns across regions (Jylhä, 2009; Manderbacka et al., 2003). Yet, to our knowledge, this possibility has not been empirically examined in the United States or within a single nation. Other work, however, as found variation within Europe (Appels et al., 1996).

Contrary to the reporting heterogeneity literature and our hypotheses, our results suggest that the relationship between SRH and five-year mortality does not vary across regions at any level of SRH within racial/ethnic groups. Across numerous model specifications, we are unable to reject the null hypothesis of homogeneous reporting across the four Census regions of the United States.

Given that we do not find any significant regional differences in the relationship between SRH and mortality despite conducting numerous tests, these additional robustness tests guard against making Type II errors. That is, they provide additional assurance that we are not accepting a false null hypothesis. Put another way, our analyses have given us multiple chances to reject the null hypothesis, but our analyses have failed to do so, providing stronger evidence that there are no regional differences in the association between SRH and mortality.

Although there is considerable evidence of reporting heterogeneity across various social and demographic groups, our study is not the only

one which finds that homogeneity in the correspondence between SRH and mortality across diverse populations. Several papers find only minor differences between sociodemographic groups. For example, Burstrom & Fredlund (2001) found that SRH is strongly related to mortality in six Swedish social classes for both men and women. Similarly, van Doorslaer & Gerdttham (2003) found no evidence that the relationship between SRH and mortality varies by either education or income. Even in the United States, a handful of studies also fail to find any evidence of reporting heterogeneity (see Idler & Benyamini, 1995). We add to this literature and, like the authors of this prior work, contend that SRH is a reasonable measure for quantifying and investigating health inequalities.

The ability to quantify these differences across Census regions is becoming especially critical as a growing body of research investigates variation in health and mortality across geography within the United States (e.g., Baicker, Chandra, & Skinner, 2005; Geronomus, Bound, & Waidmann, 1999; Montez, Zajacova, & Hayward 2016; Pickle et al., 1997). The authors found that women’s educational gradients in mortality were narrowest in the Northeast United States. Such studies help to demonstrate the importance of spatial context for health and its determinants.

Yet, the reasons for the existence of these regional patterns and the extent of their influence are largely underexplored, in part due to data requirements. Many health outcomes (and even mortality) are relatively rare events. Breaking the population into smaller geographic units in addition to other subgroups (e.g., based on age, race/ethnicity, or sex) lead to insufficiently small samples to obtain stable estimates. However, given that SRH is measured across the entire sample in numerous surveys, the measure can provide additional leverage in understanding the root of regional health differences. Our results provide evidence to suggest that regional differences in SRH are not merely reflecting regional variation in SRH reporting due to potentially different health assessments and reference groups.

4.2. Limitations

Our analyses are not without limitations. First, we only examined regional variation in the predictive validity of SRH for mortality. While

mortality is an important health outcome, research has also linked SRH to other health indicators, including biomarkers (e.g., Dowd & Zajacova, 2010). There may be regional differences in the predictive validity of SRH with respect to other health outcomes or markers. Such measures capture less extreme health states than mortality and may, therefore, be more sensitive for finding differences in predictive validity. However, our data do not allow us to examine other health measures due to changes in the NHIS design that occur across waves nor specific causes of death due to sample size. Moreover, all NHIS health data are self-reported; to the extent that access to information about one's diagnoses surely affects one's health assessment, estimates of predictive validity of SRH would be liberally biased. Because of sample size limitations, our data did not allow us to examine more than two racial groups or examine Hispanic populations. Future research is required to determine whether our findings also extend to other racial/ethnic groups, especially groups for whom English might not be the primary language.

Second, we were only able to measure region using a four-category measure, and these large geographic aggregations may obscure underlying variation within each region. The South, for example, is comprised of sixteen different states and the District of Columbia. Prior research (e.g., Porell & Miltiades, 2002; Lin, 2000) suggests that individuals who live in the Deep South have worse health and worse

health care access than those who live elsewhere the South. Our data were too sparse to allow us to examine these sub-regional differences. As more NHIS mortality data become available, future research will be able to investigate potential sub-regional differences in the predictive validity of SRH for mortality.

Third, NHIS data use a probabilistic matching algorithm and the National Death Index (NDI) to determine whether a respondent has died. This matching procedure relies on sufficient information from NHIS respondents, which might differ by sociodemographic characteristics. Based on its probabilistic nature, it also might misclassify some dead respondents as alive, and vice versa. This limitation, however, is shared by most large-scale social surveys with mortality data.

4.3. Conclusions

We found that SRH is a useful tool for understanding regional patterns of health for both non-Hispanic black and non-Hispanic white Americans in race-stratified models. Our results suggest that differences in SRH across regions are not solely due to differences in how respondents assess their health across regions; rather, they reflect true epidemiological differences. Future research can, therefore, employ this common measure to investigate the geographic patterning of health in the United States.

Appendix A

See Tables A-1–A-5.

Table A-1

Association between SRH and Five-year Mortality across Regions, Basic Model, Hazard Ratios [and 95% Confidence Intervals].

	Non-Hispanic White	Non-Hispanic Black
SxVG	1.51 [1.26, 1.8]	0.93 [0.64, 1.34]
SxG	2.40 [2.03, 2.84]	1.73 [1.26, 2.39]
SxF	4.43 [3.75, 5.23]	2.72 [1.97, 3.74]
SxP	9.57 [8.05, 11.37]	4.56 [3.27, 6.36]
NExE	1.19 [0.94, 1.5]	1.17 [0.58, 2.34]
NExVG	1.40 [1.16, 1.69]	1.18 [0.77, 1.83]
NExG	2.30 [1.93, 2.74]	1.35 [0.92, 1.99]
NExF	4.23 [3.51, 5.10]	2.85 [1.95, 4.18]
NExP	12.11 [9.77, 50.02]	5.11 [3.35, 7.80]
MWxE	0.95 [0.75, 1.21]	0.84 [0.41, 1.70]
MWxVG	1.48 [1.24, 1.77]	1.27 [0.83, 1.95]
MWxG	2.20 [1.86, 2.60]	1.82 [1.25, 2.65]
MWxF	4.55 [3.83, 5.41]	2.26 [1.56, 3.27]
MWxP	10.50 [8.65, 12.75]	4.77 [3.19, 7.13]
WxE	0.85 [0.67, 1.09]	1.14 [0.57, 2.31]
WxVG	1.38 [1.13, 1.68]	1.15 [0.66, 2.00]
WxG	2.08 [1.73, 2.50]	1.43 [0.90, 2.25]
WxF	4.51 [3.72, 5.47]	2.42 [1.52, 3.85]
WxP	9.45 [7.53, 11.85]	4.24 [2.55, 7.07]
Age	1.08 [1.08, 1.09]	1.06 [1.06, 1.07]
Survey year	0.98 [0.97, 0.99]	0.98 [0.96, 0.99]
Female	0.62 [0.59, 0.65]	0.62 [0.56, 0.69]

Table A-2

Association between SRH and Five-year Mortality across Regions, Full Model, Hazard Ratios [and 95% Confidence Intervals].

	Non-Hispanic White	Non-Hispanic Black
SxVG	1.39 [1.16, 1.66]	0.88 [0.61, 1.27]
SxG	1.92 [1.63, 2.28]	1.49 [1.07, 2.06]
SxF	2.85 [2.40, 3.38]	1.85 [1.32, 2.59]
SxP	5.16 [4.31, 6.17]	2.49 [1.74, 3.57]
NExE	0.66 [0.43, 1.02]	1.13 [0.55, 2.33]
NExVG	0.73 [0.48, 1.10]	1.11 [0.66, 1.89]
NExG	1.03 [0.69, 1.56]	1.13 [0.70, 1.82]

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Table A-2 (continued)

	Non-Hispanic White	Non-Hispanic Black
NExF	1.55 [1.03, 2.34]	1.94 [1.19, 3.17]
NExP	3.77 [2.46, 5.77]	3.04 [1.81, 5.09]
MWxE	0.58 [0.39, 0.86]	0.77 [0.36, 1.63]
MWxVG	0.84 [0.59, 1.21]	1.15 [0.7, 1.89]
MWxG	1.07 [0.75, 1.54]	1.47 [0.93, 2.30]
MWxF	1.78 [1.24, 2.55]	1.35 [0.85, 2.13]
MWxP	3.53 [2.44, 5.12]	2.59 [1.59, 4.21]
WxE	0.50 [0.32, 0.77]	0.88 [0.41, 1.87]
WxVG	0.76 [0.51, 1.13]	0.85 [0.44, 1.63]
WxG	0.97 [0.65, 1.45]	0.9 [0.51, 1.59]
WxF	1.74 [1.16, 2.6]0	1.24 [0.69, 2.21]
WxP	3.11 [2.04, 4.73]	1.69 [0.91, 3.16]
Age	1.08 [1.08, 1.08]	1.06 [1.05, 1.06]
Survey year	1.01 [0.99, 1.03]	0.98 [0.95, 1.02]
Female	0.60 [0.57, 0.63]	0.60 [0.54, 0.67]
Education		
< HS	1.04 [0.98, 1.11]	1.09 [0.95, 1.25]
Some college	0.94 [0.88, 1.00]	1.14 [0.96, 1.34]
BA +	0.80 [0.74, 0.87]	0.87 [0.68, 1.10]
Insured	0.84 [0.73, 0.96]	1.18 [0.95, 1.46]
Activity Limitation	1.99 [1.88, 2.11]	2.11 [1.84, 2.42]
% in region		
Excellent SRH	34.71 [0.55, 2207.94]	1035.44 [3.32, 323131.20]
Very Good SRH	2.58 [0.07, 101.71]	48.52 [0.32, 7396.24]
Fair SRH	9.21 [0.01, 8216.89]	3.48 [0.01, 1625.70]
Poor SRH	0.00 [0.00, 0.04]	0.12 [0.00, 621.19]
Activity limitation	34.71 [0.55, 2207.94]	1035.44 [3.32, 323131.20]
Insured	2.58 [0.07, 101.71]	48.52 [0.32, 7396.24]

Table A-3

Variance Inflation Factors (VIFs) for independent variables and covariates.

Variable	VIF	1/VIF
SxVG	2.03	0.49
SxG	2.14	0.47
SxF	1.70	0.59
SxP	1.45	0.69
NExE	6.08	0.16
NExVG	7.01	0.14
NExG	7.13	0.14
NExF	3.38	0.30
NExP	1.83	0.55
MWxE	5.62	0.18
MWxVG	6.87	0.15
MWxG	6.96	0.14
MWxF	3.54	0.28
MWxP	1.96	0.51
WxE	5.29	0.19
WxVG	5.39	0.19
WxG	5.20	0.19
WxF	2.75	0.36
WxP	1.75	0.57
Age	1.16	0.86
Survey year	11.84	0.08
Female	1.02	0.98
% in region		
Excellent SRH	11.80	0.08
Very Good SRH	16.59	0.06
Fair SRH	15.31	0.07
Poor SRH	21.89	0.05
Activity limitation	10.75	0.09
Insured	9.63	0.10
Education		

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Table A-3 (continued)

Variable	VIF	1/VIF
< HS	1.33	0.75
Some college	1.27	0.79
BA +	1.34	0.75
Insured	1.05	0.95
Activity Limitation	1.40	0.71

Table A-4

Association between SRH and Five-year Mortality across Regions, Basic Model with Explicit Main Effects, Hazard Ratios [and 95% Confidence Intervals].

	Non-Hispanic White	Non-Hispanic Black
Region (ref.=South) Northeast		
Midwest	1.19 [0.94, 1.50]	1.17 [0.58, 2.34]
West	0.95 [0.75, 1.21]	0.84 [0.41, 1.70]
	0.85 [0.67, 1.09]	1.14 [0.57, 2.31]
SRH (ref. = Excellent)		
Very Good	1.51 [1.26, 1.80]	0.93 [0.64, 1.34]
Good	2.40 [2.03, 2.84]	1.73 [1.26, 2.39]
Fair	4.43 [3.75, 5.23]	2.72 [1.97, 3.74]
Poor	9.57 [8.05, 11.37]	4.56 [3.27, 6.36]
Region x SRH		
Northeast		
x Very Good	0.78 [0.59, 1.03]	1.10 [0.49, 2.44]
x Good	0.81 [0.62, 1.05]	0.67 [0.31, 1.42]
x Fair	0.80 [0.61, 1.05]	0.90 [0.43, 1.90]
x Poor	1.06 [0.79, 1.43]	0.96 [0.44, 2.08]
Midwest		
x Very Good	1.03 [0.78, 1.36]	1.64 [0.73, 3.67]
x Good	0.96 [0.74, 1.25]	1.26 [0.59, 2.68]
x Fair	1.08 [0.83, 1.41]	1.00 [0.47, 2.12]
x Poor	1.15 [0.87, 1.53]	1.25 [0.58, 2.72]
West		
x Very Good	1.07 [0.80, 1.43]	1.09 [0.45, 2.61]
x Good	1.02 [0.77, 1.34]	0.72 [0.33, 1.60]
x Fair	1.20 [0.90, 1.59]	0.78 [0.35, 1.74]
x Poor	1.16 [0.85, 1.58]	0.82 [0.35, 1.88]
Age	1.08 [1.08, 1.09]	1.06 [1.06, 1.07]
Survey year	0.98 [0.97, 0.99]	0.98 [0.96, 0.99]
Female	0.62 [0.59, 0.65]	0.62 [0.56, 0.69]

Table A-5

Association between SRH and Five-year Mortality across Regions, Full Model with Explicit Main Effects, Hazard Ratios [and 95% Confidence Intervals].

	Non-Hispanic White	Non-Hispanic Black
Region (ref.=South)		
Northeast	0.66 [0.43, 1.02]	1.13 [0.55, 2.33]
Midwest	0.58 [0.39, 0.86]	0.77 [0.36, 1.63]
West	0.5 [0.32, 0.77]	0.88 [0.41, 1.87]
SRH (ref. = Excellent)	[.]	[.]
Very Good	1.39 [1.16, 1.66]	0.88 [0.61, 1.27]
Good	1.92 [1.63, 2.28]	1.49 [1.07, 2.06]
Fair	2.85 [2.40, 3.38]	1.85 [1.32, 2.59]
Poor	5.16 [4.31, 6.17]	2.49 [1.74, 3.57]
Northeast		
x Very Good	0.79 [0.60, 1.05]	1.13 [0.51, 2.50]
x Good	0.82 [0.63, 1.06]	0.67 [0.31, 1.44]
x Fair	0.82 [0.63, 1.08]	0.93 [0.44, 1.97]

(continued on next page)

Table A-5 (continued)

	Non-Hispanic White	Non-Hispanic Black
x Poor	1.11 [0.83, 1.49]	1.08 [0.5, 2.34]
Midwest		
x Very Good	1.05 [0.79, 1.38]	1.72 [0.76, 3.86]
x Good	0.96 [0.74, 1.25]	1.29 [0.6, 2.75]
x Fair	1.08 [0.83, 1.41]	0.95 [0.45, 2.02]
x Poor	1.18 [0.89, 1.57]	1.35 [0.62, 2.95]
West		
x Very Good	1.1 [0.82, 1.47]	1.1 [0.46, 2.66]
x Good	1.01 [0.77, 1.33]	0.69 [0.31, 1.53]
x Fair	1.22 [0.92, 1.62]	0.76 [0.34, 1.69]
x Poor	1.21 [0.89, 1.65]	0.78 [0.34, 1.8]
Age	1.08 [1.08, 1.08]	1.06 [1.05, 1.06]
Survey year	1.01 [0.99, 1.03]	0.98 [0.95, 1.02]
Female	0.6 [0.57, 0.63]	0.6 [0.54, 0.67]
Education (ref. HS)		
Less than HS	1.04 [0.98, 1.11]	1.09 [0.95, 1.25]
Some college	0.94 [0.88, 1.00]	1.14 [0.96, 1.34]
College	0.8 [0.74, 0.87]	0.87 [0.68, 1.10]
Insured	0.84 [0.73, 0.96]	1.18 [0.95, 1.46]
Activity Limitation	1.99 [1.88, 2.11]	2.11 [1.84, 2.42]
% in region		
Insured	6.35 [0.3, 134.08]	14.25 [0.29, 711.06]
Activity Limitation	173.39 [0.57, 53021.16]	0.23 [0, 86.93]
Excellent SRH	34.71 [0.55, 2207.94]	135.44 [3.32, 323131.20]
Very Good SRH	2.58 [0.07, 101.71]	48.52 [0.32, 7396.24]
Fair SRH	9.21 [0.01, 8216.89]	3.48 [0.01, 1625.70]
Poor SRH	0 [0.00, 0.04]	0.12 [0.00, 621.19]

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