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Why Does the Importance of Education for Health Differ across the United States?

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Abstract

The positive association between educational attainment and adult health ("the gradient") is stronger in some areas of the United States than in others. Explanations for the geographic pattern have not been rigorously investigated. Grounded in a contextual and life-course perspective, the aim of this study is to assess childhood circumstances (e.g., childhood health, compulsory schooling laws) and adult circumstances (e.g., wealth, lifestyles, economic policies) as potential explanations. Using data on U.S.-born adults aged 50 to 59 years at baseline ($n = 13{,}095$) and followed for up to 16 years across the 1998 to 2014 waves of the Health and Retirement Study, the authors examined how and why educational gradients in morbidity, functioning, and mortality vary across nine U.S. regions. The findings indicate that the gradient is stronger in some areas than others partly because of geographic differences in childhood socioeconomic conditions and health, but mostly because of geographic differences in adult circumstances such as wealth, lifestyles, and economic and tobacco policies.

Keywords

education, geography, life course, policy, health

Educational attainment is considered one of the strongest social stratifiers of health among U.S. adults (e.g., Galea et al. 2011). However, recent studies have shown that it is stronger in some areas of the country than in others. For instance, the gap in disability prevalence between adults without high school credentials and their college-educated peers is nearly twice as large in some U.S. states than in others (Montez, Zajacova, and Hayward 2017). Such geographic patterns underscore the need to investigate how contexts shape the importance of educational attainment for adult health.

U.S. studies describing how the education-health association (often referred to as "the gradient") varies across contexts have focused on states (Montez, Hayward, and Zajacova 2019; Montez, Zajacova, et al. 2019). These studies have also offered hypotheses about why the gradient is stronger in some areas than others. Hypotheses generally point to contemporary differences in socioeconomic and policy contexts. For instance, the gradient may be weaker in states or regions with more progressive tax structures and stronger safety nets because such characteristics disproportionately benefit lower educated adults and may attenuate their health disadvantage. Nevertheless, to our knowledge, no study has examined this or other hypotheses. Thus, the question remains, why does the importance of education for adult health vary across areas of the country? What does the answer say about the importance of education for health more generally?

Missing from the small but growing number of studies on the topic is a consideration of historical context, life-course dynamics, and their interplay. Historical factors such as the secular increase in educational attainment during the twentieth century, enactment of compulsory schooling laws (Goldin and Katz 2011), diffusion of new food and medical technologies (Skinner and Staiger 2007), and improvements in the epidemiologic environment (Cutler and Miller 2005) rolled out unevenly across the country. These factors may have left an indelible imprint on individuals' health from very early in their life course. Importantly, these factors also shape educational attainment. In addition, the policy environments of U.S. states have been diverging since the early 1980s in ways that may have altered the importance of education, once attained, for avoiding risks and obtaining resources for health. Complicating matters further, these historical shifts

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likely had different consequences for educational attainment and health depending on when in the life course that individuals experienced those shifts. In sum, the gradient may vary across geographic areas because both childhood and adulthood environments differ across areas.

To address these gaps, in this study we take a contextual and life-course approach to examine why the gradient varies across the United States. We use nationally representative panel data on adults aged 50 to 59 years at baseline, followed for up to 16 years, in the 1998 to 2014 waves of the Health and Retirement Study (HRS), merged with contextual data on the states where the respondents resided in childhood and adulthood. Extending prior work, we examine the prevalence of health problems in midlife, subsequent incidence of health problems, and mortality to glean insights on when in the life course the geographic variation emerges and why. The findings underscore the importance of integrating contextual and life-course perspectives for explaining the gradient.

Background

Educational Attainment and U.S. Adult Health

Adults with more years of schooling have better overall health and lower mortality than their less educated peers. The association between education and adult health exists across numerous outcomes, such as self-assessed health, diabetes, cardiovascular disease (CVD), cancer, and physical limitations (see review in Zajacova and Lawrence 2018). Adults with more years of schooling also tend to live longer and spend a greater portion of their years with good physical (Montez and Hayward 2014) and cognitive (Crimmins et al. 2018) functioning. For instance, in 2010, U.S. adults aged 65 years with bachelor's degrees or higher could expect to spend more than 80 percent of their remaining years of life with good cognition, compared with less than 50 percent of remaining years for their peers without high school credentials (Crimmins et al. 2018).

The gradient has become stronger since the 1960s (e.g., Goesling 2007; Hayward, Hummer, and Sasson 2015; Masters, Hummer, and Powers 2012). Considerable work on these trends has examined mortality. During the 1960s and 1970s, reductions in mortality were greater for higher educated adults than their lower educated peers (e.g., Feldman et al. 1989). Since the 1980s, mortality has continued to decline among higher educated adults but has held steady or risen for lower educated adults, particularly for white women. For example, between 1990 and 2010, life expectancy at age 25 declined by 3.1 years among non-Hispanic white women without high school credentials but rose by 3.7 years among their college-educated peers (Sasson 2016).

One of the most powerful frameworks for explaining the education-health association and its growth over time is the theory of fundamental social causes (Link and Phelan 1995), denoted here as FCT. According to FCT, the gradient exists when resources (such as money, power, and social ties) that can be used to prevent disease, disability, and premature death are unevenly distributed across education levels. Indeed, higher educated adults tend to have more of these resources than their lower educated peers. As societies develop new technology and information that can benefit health, the gradient can widen even further when higher educated adults are more likely to have access to these resources (Clouston et al. 2016; Link and Phelan 1995).

Scholars have focused on three types of resources to explain the gradient among U.S. adults: economic well-being, psychosocial resources, and lifestyle behaviors (e.g., Lynch 2006; Ross and Wu 1995). Compared with their less educated peers, higher educated adults are more likely to avoid financial hardship and be employed in jobs that are safe, stable, and fulfilling (Mirowsky and Ross 2007). Higher educated adults tend to possess a greater sense of personal control and beneficial social ties, which promote health (Mirowsky and Ross 1998). They are also more likely to exercise, avoid tobacco, drink alcohol in moderation, maintain a healthy body weight (Pampel, Krueger, and Denney 2010), and incorporate new health-related information into their lifestyles (Baker et al. 2017). In addition, part of the gradient may reflect "selection" processes; for example, adolescents with poor health may truncate their schooling experience.

Although the resources described above are important, they largely ignore context. In reality, individuals are embedded in socioeconomic, epidemiologic, and policy contexts that influence the extent to which education matters for health. In fact, the importance of context (e.g., time and place) is a prominent feature of FCT and related perspectives such as the socioecological framework (Diderichsen, Evans, and Whitehead 2001), institutional theories of health inequalities (Beckfield et al. 2015; Beckfield and Krieger 2009), and constrained choices (Bird and Rieker 2008). The focus on individual-level explanations for the gradient may reflect the individualist paradigm in most U.S. studies of the gradient, in which education is often conceptualized as a personal resource (see critique in Montez, Hayward, et al. 2019). However, the fact that the gradient has changed over time and differs across place demands that context be a key part of the explanation

Contextualizing the Gradient

Taking a contextual perspective, recent studies have examined the educational gradient in mortality and disability across U.S. states (e.g., Montez et al. 2017) and regions (e.g., Sheehan, Montez, and Sasson 2018). The gradient varies markedly across these contexts. For instance, the way in which education is associated with mortality (i.e., the functional form) is different for the South than any other region in the United States, potentially reflecting unique social and

political contexts embedded in this region that shape the importance of education for mortality (Sheehan et al. 2018). In studies that investigated the gradient across states, Montez, Zajacova, et al. (2019) found that from 1999 to 2011, the relative risk for death between adults aged 45 to 89 years without high school credentials and their peers with at least 1 year of college was as low as 1.40 in Arizona and as high as 2.04 in Maryland. Also striking, disability and mortality vary little across states for high-educated adults but markedly so for low-educated adults. That is, the importance of education differs across states mainly because having a low level of education is riskier in some areas than others. In contrast, higher education may act as a "personal firewall" (Montez et al. 2017).

These geographic patterns help refine existing frameworks, such as FCT, for explaining the gradient and why it differs across contexts. Integrating several frameworks, Montez Hayward, et al. (2019) and Montez, Zajacova, et al. (2019) asserted that (1) FCT implies that higher educated adults are better able to acquire health-beneficial knowledge and resources and avoid risks, regardless of contexts, whereas (b) socioecological and constrained-choices frameworks imply that contexts disproportionately affect the health-related choices and constraints faced by low-educated adults.

Hypotheses about Why the Gradient Differs across the United States

Drawing on an extensive literature examining the causal effects of U.S. state policies on population health, recent work has developed hypotheses about precisely how geographic contexts shape the importance of education for adult health (Montez, Hayward, et al. 2019; Montez, Zajacova, et al. 2019). These hypotheses point to stark differences in contemporary socioeconomic and policy contexts of states (and these contexts that tend to cluster within regions). Some of these contexts may put low-educated adults at a particularly elevated risk for poor health.

We illustrate these contextual differences by contrasting two states on just a few policies that shape population health (Muennig et al. 2016; Tauras 2004; Van Dyke et al. 2018). New York has a substantial excise tax on cigarettes ($4.35 per pack in 2016), implemented its own earned income tax credit (EITC), participated in Medicaid expansion, and sets a minimum wage above the federal level ($9 per hour in 2016). In contrast, Mississippi has a negligible cigarette tax ($0.68 per pack in 2016), does not offer its own EITC, opted out of Medicaid expansion, defaults to the federal minimum wage, and has preempted local governments from implementing health-promoting legislation such as paid sick days, a higher minimum wage, firearm regulations, and nutrition labeling in restaurants (Montez 2017; Pomeranz and Pertschuk 2017). As expected, then, the gradient is larger in Mississippi than in New York, mainly because low-educated adults have particularly poor health in Mississippi (Montez, Hayward, et al. 2019; Montez, Zajacova, et al. 2019).

Geographical, Historical, and Life-Course Contexts

Despite recent attention to documenting the gradient across geographic areas and hypothesizing about why it varies, several questions remain unanswered. First, it is unclear when in the adult life course this variation emerges. Existing studies have examined educational gradients in the prevalence of disability (and incidence of mortality) by state for a wide 45- to 89-year age range. Consequently, it is unclear whether differences in the gradient across states appear before midlife or emerge afterward. Such information could help elucidate causal processes and identify ameliorative strategies. For instance, if the gradient differs across geographic areas among adults in midlife and these differences remain stable afterward, this points to childhood or early adult circumstances as potential explanations. In this study, we examine the prevalence of morbidity and disability in midlife and subsequent incidence of morbidity, disability, and mortality.

Second, it is unclear why the gradient varies across geographic areas of the country. Most speculation has focused on how contemporary characteristics of U.S. states shape the importance of education, once attained, for adult health. However, characteristics from early in the life course may also matter. For example, compulsory schooling laws as well as laws related to the length of the school year shape how much education an individual attains. These laws may also shape who attains education. For instance, the enactment of compulsory schooling laws was more consequential for would-be dropouts, such as children in rural and farming areas, children with disabilities or poor health, and children from economically or racially marginalized backgrounds.

For childhood circumstances, we draw on the "the long arm of childhood" literature (e.g., Hayward and Gorman 2004) reporting that children who experience poor health and adverse socioeconomic circumstances tend to attain fewer years of schooling and have poorer health as adults (e.g., Ferraro, Schafer, and Wilkinson 2016). Another reason to consider these childhood circumstances as potential explanations is that they can suppress or accentuate the health gains from schooling (Schafer, Wilkinson, and Ferraro 2013). Specifically, in this study, we incorporate the individual's own retrospectively reported overall health as a child and a contextual measure of the early-life epidemiologic environment: the infant mortality rate in the state where the respondent was born (Crimmins and Finch 2006). We incorporate the individual's own retrospectively reported childhood socioeconomic circumstances and two state laws (compulsory schooling, length of the school year), all of which predict how much schooling individuals attained.

For adult exposures, we examine the main individual-level resources through which education is thought to shape adult health: economic well-being, lifestyle behaviors, and psychosocial resources. The availability of these resources as well as social norms regarding them differ across the country. For example, having a low level of education may be particularly harmful in parts of the country where blue-collar jobs are scarce and smoking is normalized. In addition to these individual-level factors, we examine the economic and policy characteristics of the states where individuals reside. We focus on four state-level characteristics that shape population health and are disproportionately salient for low-educated adults: states' EITCs (Muennig et al. 2016), minimum wages (Van Dyke et al. 2018), unemployment rates, and tobacco taxes (Tauras 2004). These policies may mitigate the consequences of low levels of education on adult health.

A third fundamental question is whether the gradient varies across the country for outcomes other than disability and mortality, which have been the focus of prior work. Because disability is the intersection between personal capability and environmental demands (Verbrugge and Jette 1994), it should, by definition, be shaped by contextual factors. Several causes of death (e.g., accidents, homicides) are also a by-product of geographic context. It is imperative to examine a wider range of outcomes, including chronic health conditions, to glean insights into how contexts shape the importance of education in the etiology of disease, disability, and death. In this study, we examine cardiometabolic morbidity, functional limitations, disability, and mortality.

Aims

Using data on U.S.-born adults in the 1998 to 2014 waves of the HRS, we examine how and why the educational gradients in several outcomes vary across the United States. We document the gradient for the nine census-defined divisions (for ease, we refer to these as regions) because they are the smallest geographic areas for which we can robustly estimate the gradient. We then account for individual-level and state-level characteristics that may explain why the gradient differs across regions. Our study centers on two main questions: (1) How does the gradient vary across regions for prevalence and incidence of cardiometabolic morbidity, physical functioning, and mortality? and (2) How do characteristics of individuals and their states of residence at different points across the life course contribute to the variation?

Data and Methods

Data and Sample

We use data from the 1998 to 2014 HRS, which includes nine biennial waves of panel data on adults aged 50 years and older. Although the HRS started in 1992, it became nationally representative of adults older than 50 in 1998. We use the restricted version of the HRS; it is an ideal source to address our aims because it identifies where respondents lived at multiple points across the life course (birth, age 10, and survey year) and contains retrospectively reported information on childhood circumstances.

Similar to prior work (Zhang and Hayward 2006), we define both a prevalence and an incidence sample. The prevalence sample provides insights into the extent to which the regional variation in the gradient is established prior to midlife. It includes adults aged 50 to 59 years during the first wave in which they were interviewed from 1998 to 2014.[1] We selected ages 50 to 59 because this range provides the youngest midlife sample we could create while maintaining a large sample size for the analysis. The prevalence sample includes 13,095 adults born between 1939 and 1964. We exclude the few adults missing information on race/ethnicity or region of residence or birth ($n = 55$).

Adults in the prevalence sample who did not have the health outcome of interest (e.g., CVD) were retained for the incidence sample. Consequently, the sample size for the incidence analyses differs by outcome, from 45,566 person-year observations for mobility to 108,946 for mortality. Because we capture incidence from 1998 to 2014, a respondent aged 59 in 1998 is 75 years of age in 2014; thus, the age range of the incidence sample is 50 to 75 years. Also important, respondents can "age into" the sample. For example, a respondent aged 40 years in the 1992 HRS enters our sample when he or she turns 50 in the 2002 HRS. Last, we exclude individuals born or living outside of the United States or in Washington, D.C., consistent with recent work.

Outcomes: Morbidity, Disability, and Mortality

We examine three measures of cardiometabolic morbidity: CVD, hypertension, and diabetes. For each measure and at each wave, respondents reported whether they had ever received a doctor's diagnosis. Disability is a binary indicator for which 1 = self-reported difficulty with any of 10 activities of daily living or instrumental activities of daily living, such as bathing and managing medications (Spector and Fleishman 1998; Zajacova and Montez 2018). Mobility limitations are also binary, where 1 = difficulty with any of five lower body tasks, such as walking a block or climbing a flight of stairs. We also examine all-cause mortality.

Main Exposures: Educational Attainment and Region

The main exposures of interest are education and the nine U.S. Census divisions, hereafter referred to as regions. Figure 1

[1]The modal year of entry is 1998. The percentages of our analytic sample that first appear in each HRS wave are 42.5 percent in 1998, 2.2 percent in 2000, 1.4 percent in 2002, 19.2 percent in 2004, 2.1 percent in 2006, 1.5 percent in 2008, 27.2 percent in 2010, 2.1 percent in 2012, and 1.7 percent in 2014.

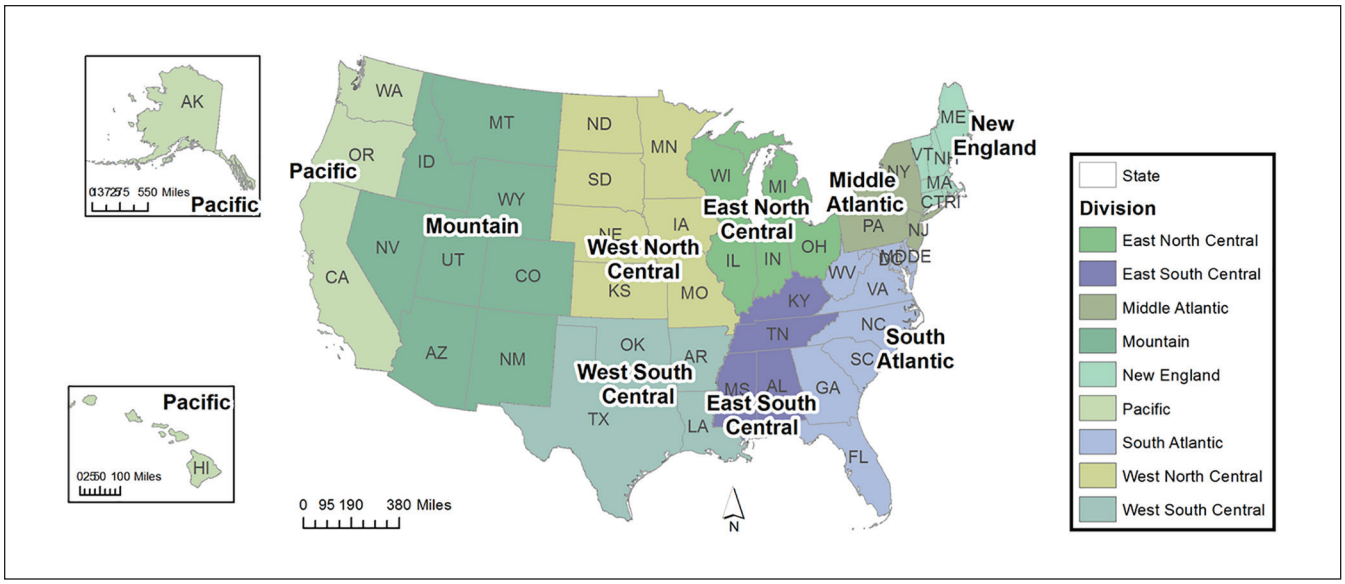

Figure 1. U.S. Census divisions.
Source: U.S. Census Bureau (https://www.census.gov/geo/reference/webatlas/divisions.html).

shows which states are grouped into each region. Education is captured by three categories: less than high school, high school credential (GED or diploma) or some college, and a bachelor's degree or higher. We chose a categorical specification because the educational gradient among these cohorts is nonlinear (e.g., Hayward et al. 2015).

Childhood Circumstances

We include two key individual-level measures that can influence both educational attainment and adult health. Drawing on prior work (Kemp et al. 2018), we dichotomize childhood health into unfavorable (which includes fair and poor) and favorable (good, very good, and excellent). We dichotomize childhood socioeconomic conditions into adverse (parents were economically worse off than others) and not adverse (parents were similar to or better off than others, or it varied).

We include two state-level measures that can shape educational attainment: compulsory schooling and length of the school year. For compulsory schooling, we include the (presumed) minimum age for school leaving among respondents' parents (data from Goldin and Katz 2003). This decision is based on the fact that (1) there is little state-level variation in the minimum age for school leaving among cohorts in our study, yet (2) there was large variation for their parents' generation, and parental exposure to these laws has significant effects on their children's educational attainment (Oreopoulos, Page, and Stevens 2006). To merge this state-level information into our data, two (reasonable) assumptions are necessary given data limitations: parents completed their education in their children's state of birth and are approximately 25 years older than their children. As an illustration, the minimum school-leaving age assigned to a respondent born in New York in 1939 is assigned as the school-leaving age in New York in 1914. Our second measure, length of the school year when respondents were age 10, is taken from the Biennial Survey of Education for 1909 to 1958 and the *Digest of Educational Statistics* for 1958 to 1985.[2] As an indicator of the epidemiological environment around the time of birth, we include the infant mortality rate in the respondents' state of birth (National Center for Health Statistics 2015).

Adult Circumstances

We include several individual-level measures representing the three main pathways (economic well-being, psychosocial resources, and lifestyles) through which education is thought to shape adult health. Given the age range of our sample, we include wealth as a marker of economic well-being. Wealth is taken from the RAND file and measured as the sum of all wealth components minus all debt. It is adjusted for skewness with a cube root. Partnership status is a four-category variable: married or partnered (reference), divorced or separated, widowed, or never married. Smoking is a three-category variable: never smoked (reference), former smoker, or current smoker. Heavy alcohol consumption is a dichotomous indicator, defined as four or more drinks on a single occasion for women and five or more for men (Dawson 2011). Body mass index (BMI) is measured in kilograms per square meter.

The eight contextual variables include state-level minimum wage at age 30 and again at age 50 to 59, when the

[2]The years linearly interpolated include 1911 to 1917, 1923 to 1928, and 1977 to 1979.

respondent first enters our sample; state-level EITC at age 30 and age 50 to 59; state-level tobacco excise taxes at age 30 and age 50 to 59; and state-level unemployment rate at age 30 and age 50 to 59. We chose age 30 because it is a reasonable approximation midway between education completion and the HRS interview. Moreover, given the age of our sample, many state-level policies simply did not exist for many respondents when they were younger than 30, or the variation in the policies was minuscule across states. To merge these state-level data into the HRS, we used the state of residence when the respondent first enters our sample at age 50 to 59 (the HRS does not contain information on where respondents lived at age 30). We conduct sensitivity analyses using respondents' age of residence at age 10 to assign state-level variables; we discuss these findings in the "Results" section.

We located the state-level data from multiple sources. For most variables, the data were available for all calendar years starting in 1968, when respondents were aged 30 or older. State-level minimum wage is available for 1968 onward (Vaghul and Zipperer 2016), as are tobacco taxes (Orzechowski and Walker 2014).[3] Minimum wage and tobacco taxes were converted to 2014 dollars. EITC is coded as 1 each year it was offered. State-level data on unemployment are available for 1976 to 2014 (Bureau of Labor Statistics n.d.); years 1968 to 1975 were backfilled using information from 1976.

Covariates

We adjust all models for age, sex, calendar year, race/ethnicity, and region of birth. Sex is coded 1 for women and 0 for men. Race/ethnicity includes non-Hispanic white, non-Hispanic black, non-Hispanic other, and Hispanic. Region of birth uses the same categories as region of residence.

Methods

To address the first research question, we start by examining prevalence. As stated earlier, we include all U.S.-born individuals aged 50 to 59 years when first interviewed between 1998 and 2014. We estimate equation 1, where $\mathbf{b}_1$ is a vector for educational attainment, $\mathbf{b}_2$ is a vector for region of residence, $\mathbf{b}_3$ is a vector containing the education-by-region interactions, and $\mathbf{b}_4$ is a vector of covariates.

$$\begin{aligned}\ln(\text{odds}) &= \mathbf{b}_0 + \mathbf{b}_1\text{ed} + \mathbf{b}_2\text{region} \\ &\quad + \mathbf{b}_3(\text{ed} \times \text{region}) + \mathbf{b}_4\text{covariates}.\end{aligned} \tag{1}$$

To examine incidence of each outcome, we remove adults from the prevalence sample who reported having the outcome when they were first observed in the sample (e.g., having CVD). We then created a person-year file containing an observation for each year the individual is outcome free until their death or the end of 2014.

To examine our second research question, we first add the childhood measures to equation 1 and then add the adulthood measures. We assess the extent to which they help explain why the gradient is stronger in some regions than others by examining the Wald χ^2 of the education-by-region interaction after each set of measures is added to the model. The null hypothesis for the Wald χ^2 is that all $\mathbf{b}_3 = 0$. The Wald χ^2 is computationally straightforward to obtain in Stata (using the testparm command) and is asymptotically equivalent to the likelihood ratio test.

The small number of missing data on continuous variables is imputed using the mean; BMI has the highest amount of missing at 2.4 percent, followed by wealth at less than 1 percent. For the childhood health and socioeconomic variables, we draw from prior work that extensively analyzed the missing data pattern and coded item missing as favorable and not adverse, respectively (Montez and Hayward 2014); these variables have less than 1 percent missing each. Information on partner status is taken from the subsequent wave for cases with missing information (less than 1 percent). Information on when the respondent began smoking and stopped smoking, how much they smoked, and reports from proxies upon exit interviews are used to fill in missing information on smoking status (1.3 percent); without evidence of smoking, the remaining are set to never smokers (less than 1 percent). For the adult state-level variables at first interview, 13 records did not identify state of residence, so the state from the following interview was used for these individuals. Given that respondents are nested within regions, and that we consider this clustering to be a nuisance rather than a multilevel parameter to be estimated, the models include standard errors clustered by region (clustering by state does not alter the findings). All models are estimated using Stata 12.1.

Results

Table 1 shows the distribution of select exposures and covariates for the prevalence sample by U.S. region (for parsimony, we do not show the same information for the incidence sample, because the sample differs for each outcome). Among the prevalence sample, the proportion of adults with less than a high school education in each region ranges from 8.7 percent in West North Central to 26.5 percent in West South Central. West South Central has the lowest percentage with a bachelor's degree or higher at 18.5 percent, and New England has the highest at 40.5 percent. Table 2 contains the prevalence and incidence of each outcome by region. Among adults aged 50 to 59 during their first wave in the study, the prevalence of each outcome ranges from 7.6 percent for CVD in New England to 48.3 percent for hypertension in West South Central. Among adults who were outcome free at that first wave, the incidence of each outcome during

[3]Tobacco excise tax was missing for North Carolina for 1968 and 1969. These years were imputed using data from 1970, the first year for which data were available.

Table 1. Select Descriptive Statistics of the Analytic Sample by U.S. Region (Health and Retirement Study 1998–2014).

	New England	Mid-Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Race/ethnicity (%)									
Non-Hispanic white	88.2	72.4	79.1	87.4	64.1	65.6	54.5	72.1	70.1
Non-Hispanic black	8.8	23.6	18.3	9.3	32.2	32.7	24.7	3.9	12.0
Hispanic	0.9	3.0	1.4	1.7	1.4	0.1	19.0	19.0	13.8
Non-Hispanic other	2.1	1.1	1.2	1.7	2.3	1.7	1.8	5.0	4.1
Childhood circumstances									
Adverse parental socioeconomic status (%)	16.6	22.0	24.3	26.1	28.6	33.8	33.7	26.3	22.5
Poor/fair health (%)	5.2	5.7	6.4	4.6	5.7	7.8	9.3	7.3	7.0
Length of school year (days)	179.3	180.9	179.0	178.0	179.3	175.3	176.2	177.5	177.8
Infant mortality rate (per 1,000)	30.0	31.1	31.8	31.7	38.0	40.1	38.1	34.6	31.1
Compulsory schooling age (years)	15.9	15.7	15.8	15.9	14.4	14.4	14.3	15.8	15.6
Adulthood circumstances									
Educational attainment (%)									
0–11 years	9.0	12.7	11.1	8.7	19.3	23.1	26.5	10.5	9.8
12–15 years	50.5	59.5	67.4	64.5	56.4	55.5	55.0	59.6	59.5
≥16 years	40.5	27.8	21.5	26.9	24.3	21.4	18.5	30.0	30.7
Wealth (×$1,000)	537.1	308.7	344.7	375.0	300.6	210.8	167.7	307.0	479.1
Married (%)	79.4	70.4	76.1	76.6	73.7	71.8	73.1	76.0	73.5
Never smoked (%)	38.9	35.9	38.4	42.3	39.2	41.4	39.7	40.4	43.3
Body mass index (kg/m^2)	27.8	28.5	28.9	28.5	28.6	29.0	29.5	28.0	28.2
Heavy alcohol consumption (%)	5.6	8.1	6.9	6.7	6.5	5.3	8.9	6.8	6.2
Earned income tax credit (%)									
At age 30	0.0	0.1	1.6	1.0	1.7	0.0	0.0	0.0	0.0
At age 50	44.6	62.2	48.5	41.5	19.1	0.0	10.4	1.2	8.5
Tobacco excise tax (2014 dollars)									
At age 30	0.6	0.6	0.5	0.5	0.4	0.4	0.6	0.4	0.4
At age 50	1.4	1.7	1.1	0.5	0.5	0.4	0.8	1.0	1.1
Unemployment rate (%)									
At age 30	6.9	8.1	8.2	5.4	7.1	7.9	6.8	6.6	8.1
At age 50	5.1	6.6	6.5	4.5	6.0	7.0	6.3	6.4	7.9
Minimum wage (2014 dollars)									
At age 30	8.7	8.5	8.6	8.7	8.6	8.5	8.4	8.3	8.6
At age 50	7.8	7.4	7.4	7.3	7.4	7.4	7.4	7.3	8.3

follow-up ranges from 8.9 percent for mortality in the Pacific region to 50 percent for mobility limitations in West South Central.

How Does the Gradient Vary across Regions?

Figures 2 and 3 summarize the results across prevalence and incidence models, respectively, for all outcomes. To more clearly show the results, we plot marginal probabilities of each outcome on the basis of models that include education, region of residence, the education-by-region interaction, and the covariates age, sex, race/ethnicity, region of birth, and calendar year (i.e., baseline models). Importantly for our aims, the gradient differs across regions. The education-by-region interactions are significant in each model (Wald χ^2 p value for overall interaction $<$ 0.001), and adding the interaction to each model improves its fit to the data. In sum, higher educational attainment is significantly more important for preventing cardiometabolic morbidity, poor functional health, and mortality in some regions than in others. We now discuss in detail the results for CVD; for space considerations, we later summarize the results for the other five outcomes.

Prevalence. The top left panel of Figure 2 shows the marginal probabilities of CVD. The regions are sorted from highest to lowest probability of CVD among low-educated adults. Two patterns stand out. First, consistent with the education-by-region interaction terms, the size of the gradient visibly differs across regions. It is negligible in West North Central (North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri) and largest in East South Central

Table 2. Descriptive Statistics of the Select Health Outcomes by U.S. Region (Health and Retirement Study 1998–2014).

	New England	Mid-Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Prevalence outcomes (%)									
Cardiovascular disease	7.6	12.1	13.5	9.5	12.2	15.3	14.8	10.6	11.3
Hypertension	34.1	41.5	39.6	32.5	43.4	52.5	48.3	34.1	36.9
Diabetes	8.0	13.4	12.4	9.8	13.8	16.4	18.1	10.7	11.8
Disability	12.3	16.0	13.5	10.3	16.3	18.9	20.2	14.5	15.7
Mobility	28.9	34.4	34.7	30.6	35.8	43.4	45.8	32.5	31.0
Incidence outcomes (%)									
Cardiovascular disease	17.4	17.1	17.1	16.7	18.6	20.0	17.8	13.0	13.2
Hypertension	33.6	33.4	35.8	38.1	39.3	39.6	38.0	28.1	32.1
Diabetes	14.7	14.9	14.0	14.6	18.3	15.2	15.9	11.6	14.2
Disability	19.8	20.6	21.8	21.7	25.3	27.5	27.4	19.5	21.1
Mobility	38.3	37.0	44.3	45.0	45.4	47.0	50.0	34.8	36.6
Mortality	10.5	10.8	11.2	10.1	13.5	13.2	13.2	9.1	8.9

(Kentucky, Tennessee, Mississippi, and Alabama), where CVD prevalence ranges from 23 percent of adults without high school credentials to 8 percent of adults with bachelor's degrees or higher. Second, the gradient varies mainly because CVD among low-educated adults varies. For example, the range in CVD prevalence across regions is more than double for low-educated adults (16 percentage points) than high-educated adults (7 percentage points). The greater regional variability in CVD among low-educated adults is not simply an artifact of their higher CVD prevalence.

The importance of education for avoiding the other four outcomes by midlife also differs across regions. Each panel in Figure 2 orders regions from highest to lowest prevalence of the outcome among low-educated adults. Two findings are noteworthy. First, the importance of education across regions is more consistent for functioning than for morbidity. Specifically, the gradients for both functioning measures are monotonic and large across regions (although the size of the gradient does vary). Across all regions, functioning problems are more prevalent among low- than mid-educated adults and more prevalent among mid- than high-educated adults. In contrast, gradients for CVD, hypertension, and diabetes are large in some regions but either small, nonexistent, or nonmonotonic in others. For example, in the Pacific, Mid-Atlantic, South Atlantic, and New England regions, it is primarily or only high school noncompleters who have an elevated CVD prevalence. Second, although regions with small gradients in one outcome tend to have small gradients in others (most notably, the West North Central region), there are many discrepancies. Collectively, these findings suggest that the reasons why geographic context shapes the gradient may be somewhat etiologically specific.

Incidence. We estimate the probability of developing CVD during follow-up among the subset of CVD-free respondents in the prevalence sample. We display the results in the top left panel of Figure 3. Similar to findings for CVD prevalence, the size of the gradient visibly differs across regions in predicting the development of CVD. It is largest in the Pacific (Alaska, California, Hawaii, Oregon, and Washington) and again negligible in West North Central (North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri). The gradient for CVD incidence varies across regions mainly because CVD incidence among low-educated adults varies across regions.

Each panel in Figure 3 orders regions from highest to lowest incidence of the outcome among low-educated adults. Similar to our prevalence findings, two general findings are noteworthy. First, the importance of education is clear across all regions for functioning and mortality but is small or nonexistent in one or several regions for morbidity. For instance, across all regions, functioning problems are more prevalent among low- than high-educated adults. In contrast, the gradient is negligible for CVD incidence in West North Central, hypertension incidence in East South Central, and diabetes incidence in West South Central. Second, some regions have small gradients in several health outcomes, but not all (again, the West North Central region is notable). Thus, the contextual factors that shape how education is important for avoiding the development of health problems may be specific to the health outcome in question.

Why Does the Gradient Differ across Regions?

We add the life-course exposures to the baseline models and summarize the results for all outcomes in Table 3. At the bottom of Table 3, we also include the percent attenuation of the Wald χ^2 for the education-by-region interaction when either childhood or adulthood exposures are added to the baseline model. For parsimony, Table 3 includes only coefficients for

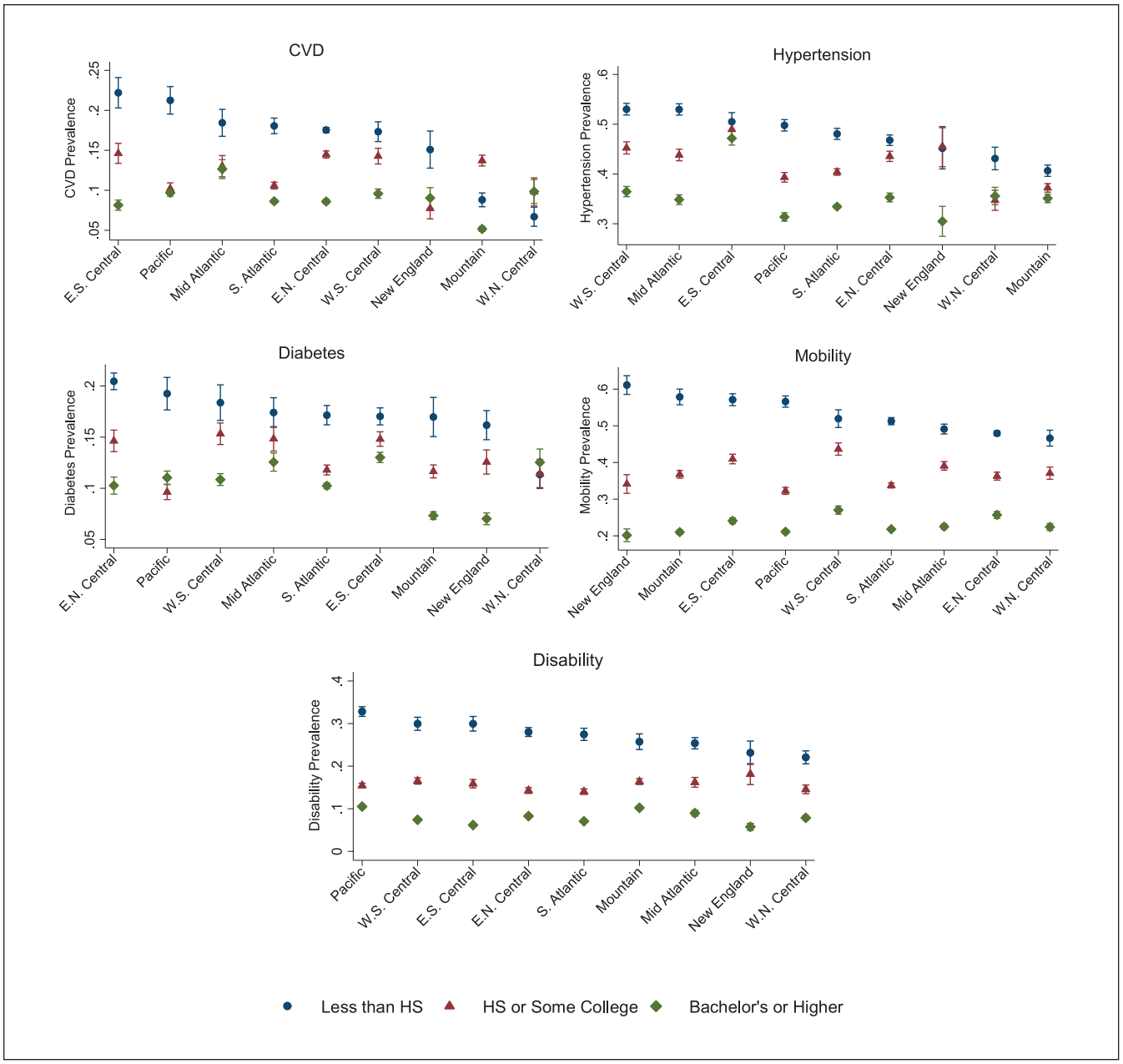

Figure 2. Probability of having health condition by education level and region of residence.
Note: Marginal probabilities are derived from models predicting the outcome from education, region, education-by-region interaction, and demographic covariates. Confidence bands use 83 percent intervals to adjust the α level for multiple comparisons (Knol et al. 2011). Abbreviations for some regions use "E" for east, "S" for south, "W" for west, and "N" for north.

childhood and adulthood exposures (full models with covariates are available in Supplementary Table S1.).

Prevalence and Incidence of CVD. In the fully adjusted model for CVD prevalence, we find that poor health in childhood is associated with an elevated odds of CVD among these midlife adults (odds ratio [OR] = 1.84, 95 percent confidence interval [CI] = 1.61–2.12), as is adverse socioeconomic status (SES) in childhood (OR = 1.18, 95 percent CI = 1.00–1.39). All of the adult SES, lifestyle, and marital status exposures are significantly related to midlife CVD in the expected direction, net of other variables in the model. So too are several state-level measures. These include, most notably, having lived in a state with an EITC at age 30, which reduced the odds of CVD in midlife by 53 percent (OR = 0.47, 95 percent CI = 0.29–0.77), as well as minimum wage at age 30 (OR = 0.89, 95 percent CI = 0.83–0.96) and living in a state with an EITC at age 50 (OR =

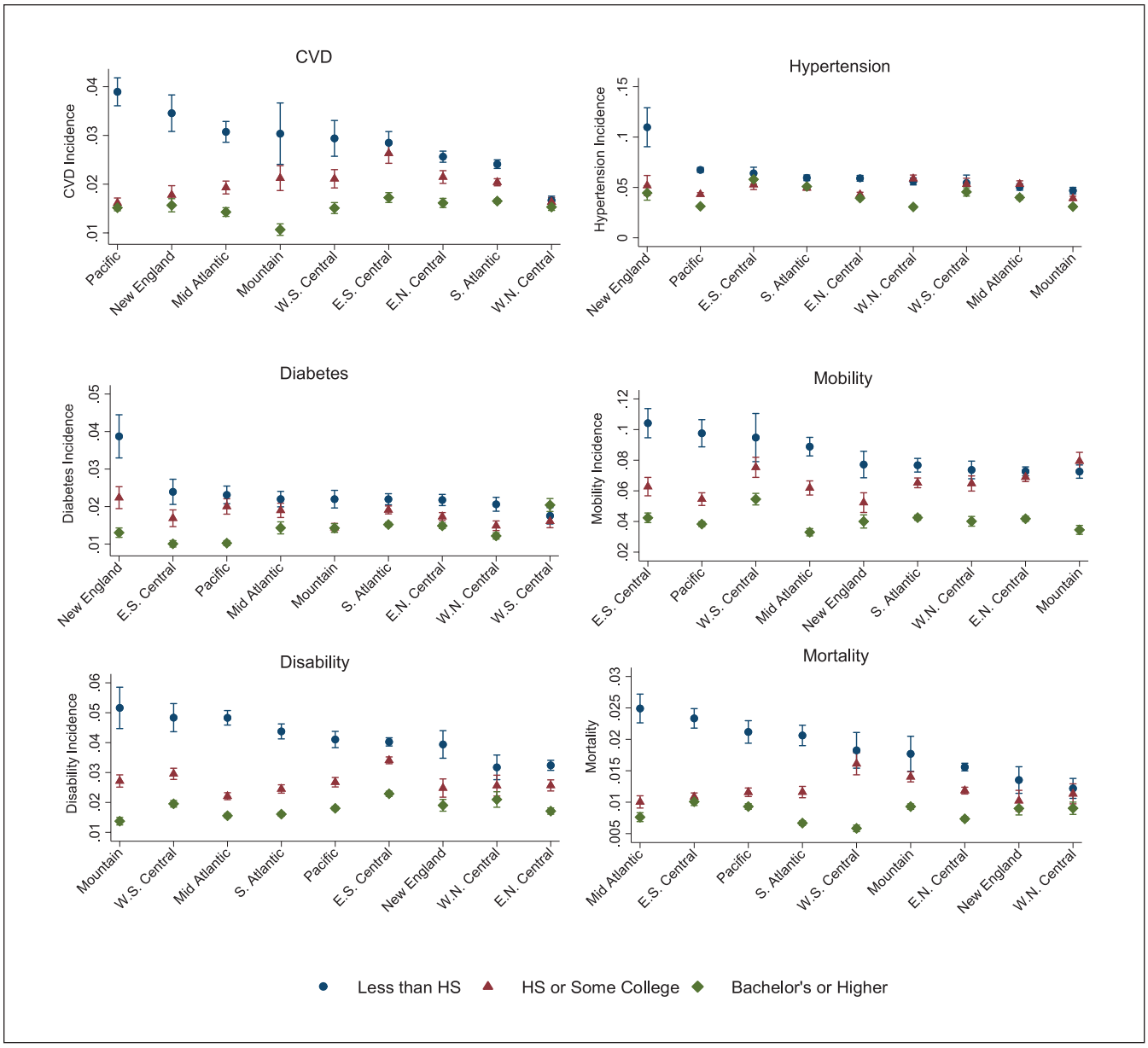

Figure 3. Probability of developing health condition by education level and region of residence.
Note: Marginal probabilities are derived from models predicting the outcome from education, region, education-by-region interaction, and demographic covariates. Confidence bands use 83 percent intervals to adjust overall α level for multiple comparisons (Knol et al. 2011). Abbreviations for some regions use "E" for east, "S" for south, "W" for west, and "N" for north.

0.91, 95 percent CI = 0.84–0.98). The childhood exposures alone reduced the Wald χ^2 of the education-by-region interaction by 33 percent, whereas the adulthood exposures alone reduced the Wald χ^2 by 68 percent.

We estimate the probability of developing CVD during the follow-up among the subset of CVD-free respondents in the prevalence sample. Again, we find that childhood health and SES are significant and meaningful predictors of CVD incidence. For instance, the odds of developing CVD were 30 percent greater for respondents who experienced adverse childhood SES than peers who did not. Length of school year had a statistically significant but very small association. Although all adult wealth, marital status, and lifestyle variables predicted CVD prevalence in midlife, only wealth, smoking, and BMI predicted subsequent incidence. Adding only the childhood exposures to the baseline model reduced the Wald χ^2 for the education-by-region interaction by 17 percent and adding only the adulthood exposures reduced the Wald χ^2 by 90 percent.

Prevalence and Incidence of All Morbidity, Functioning, and Mortality Outcomes. Looking across all outcomes reveals several

Table 3. Childhood and Adulthood Predictors of the Prevalence and Incidence of Adult Morbidity, Functioning, and Mortality (Health and Retirement Study 1998–2014).

	CVD		Hypertension		Diabetes		Mobility		Disability		Mortality
	Prevalence	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence	Incidence	Incidence
Childhood exposures											
Fair/poor health	1.844***	1.297***	1.051	1.165*	1.035	1.133	2.072***	1.350**	2.387***	1.516***	1.186
Adverse parental SES	1.183*	1.291***	1.052	1.015	1.061	0.998	1.252***	1.165***	1.300**	1.056†	0.928
Length of school year	0.997	1.014*	1.000	1.007***	0.978**	0.998	0.994	0.999	0.982†	1.010†	1.005
Infant mortality rate	0.997	0.999	0.998	1.004	1.004	0.992*	1.003	1.000	0.998	1.002	1.015***
Compulsory schooling	0.998	0.995	0.995	1.005	0.988	1.001	1.008	1.005	0.991	1.012	1.008
Adulthood exposures											
Wealth (×$1,000)	0.993***	0.996**	0.995***	0.997*	0.992***	0.999	0.989***	0.996***	0.988***	0.993***	0.991***
Marital status (married)											
Divorced	0.997	1.031	1.052	0.870*	0.943	1.098	1.100	0.936	1.316***	1.096	1.212***
Widowed	0.946	1.060	1.032	0.951	0.976	1.096	0.935	0.989	1.184†	1.057	1.325***
Never married	0.619***	1.121	1.065	0.870	0.939	0.967	1.140*	1.016	1.439***	1.138	1.311
Smoking (never smoked)											
Former smoker	1.463***	1.225**	1.121**	1.007	1.190**	0.970	1.227***	1.095**	1.378***	1.104	1.435***
Current smoker	1.362***	1.674***	1.014	1.244***	1.061	1.139*	1.866***	1.739***	1.887***	1.687***	2.708***
Body mass index	1.031***	1.043***	1.097***	1.048***	1.093***	1.095***	1.099***	1.083***	1.047***	1.053***	1.025***
Heavy alcohol consumption	0.698***	1.005	1.229*	1.198*	0.591**	0.973	0.994	1.080	0.930	1.124	1.280*
EITC at 30 years	0.472**		1.222		1.010		0.754		1.207		
EITC at 50 years	0.908*	0.954	1.033	0.984	0.924*	0.984	0.941	1.011	0.946	0.963	1.018
Tobacco tax at 30 years	1.099	1.100	0.819†	0.988	0.855	1.161	0.691*	0.928	0.680*	0.866†	0.963
Tobacco tax at 50 years	0.956	0.919	1.011	0.891*	1.052	1.011	1.046	1.070	0.999	0.955	0.805**
Unemployment at 30 years	1.019	0.990	1.021**	0.976†	1.024*	0.969	1.026**	1.000	1.047***	0.979	1.047***
Unemployment at 50 years	0.965†	1.031	1.011	1.027	0.991	0.992	0.993	1.035*	0.983	1.024	0.980
Minimum wage at 30 years	0.894**	1.073	0.998	1.100**	1.009	1.095	1.035	1.049†	1.068	1.072	1.102
Minimum wage at 50 years	0.972	1.041	1.041	0.914	0.959	1.163**	1.048	0.902†	1.109*	0.886	0.959
% change in Wald χ^2 for interaction											
All childhood predictors	−33	−17	+74	−57	−82	+623	+31	+65	−96	+28	−62
All adulthood predictors	−68	−90	−13	−94	−93	−87	−59	+65	−98	−71	−100

Note: Odds ratios are estimated from models predicting the outcome from education, region, education-by-region interaction, demographic covariates, and all childhood and adulthood exposures. Full models are available by request. CVD = cardiovascular disease; EITC = earned income tax credit; SES = socioeconomic status.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

intriguing patterns. We briefly describe these as they provide insights into why the gradient differs across regions. Childhood health and SES are especially important predictors of mobility limitations and disability; adult wealth, smoking, and BMI are important for all outcomes. Net of those factors, state contexts (EITC, tobacco tax, unemployment, and minimum wage) are also important predictors, particularly when the respondents were around the age of 30.

The percentage attenuation of the Wald χ^2 for the education-by-region interactions seen at the bottom of Table 3 show that childhood and adulthood exposures are important for explaining the gradient. For example, adding childhood exposures to the baseline model for mortality reduced the Wald χ^2 by 62 percent, whereas adding adulthood exposures reduced it by 100 percent. This suggests that both childhood and adulthood exposures help explain why education is more important for avoiding premature death in some regions than others, but adult exposures may matter more. This finding is generally consistent across outcomes, except disability prevalence.

Supplemental Analyses. We replicated the analyses to assess the robustness of our findings to different interstate migration scenarios using information on state of residence at age 10 (models available by request). Recall that in our main analyses, we controlled for region of birth and assigned the state-level variables at age 30 using the state where the respondent resided when first observed in our sample at age 50 to 59. Our decision was based on the fact that moving across state lines between ages 30 and 50 is uncommon and considerably less common than moving between ages 10 and 30 (Karahan and Li 2016) and that controlling for region of birth absorbs stable differences across birth regions. An alternative approach is to assign the state-level variables at age 30 using state of residence at age 10. Although it is a questionable approach, our analyses using it support our main conclusions. That is, the gradient varies across regions partly because of geographic differences in childhood circumstances, but mostly because of adult circumstances. Furthermore, although the importance of state-level contexts at age 30 overshadowed those at age 50 to 59 in our main analyses, this was not the case in the alternative scenario. This too supports our main conclusions. This discrepancy should be expected if the alternative "age 30" variables are misspecified and, consequently, the key state-level information is now more fully captured in the "age 50" variables.

We also replicated the analyses on the subset of adults who resided in the same state at ages 10 and ages 50 to 59. Most individuals do not migrate across states, and these "stayers" are different in some respects than "movers." Thus, the subset is not representative and contains less information. Again, our conclusions are similar, although for a few outcomes, the importance of childhood circumstances in explaining why the gradient differs across regions became similar to the importance of adult circumstances.

We also assessed whether potential multicollinearity might affect the results. Bivariate correlations among all childhood and adult variables did not indicate that multicollinearity was an issue. Nonetheless, we reestimated the models to assess whether the coefficients for each state-level variable materially changed when excluding all other state-level variables. The coefficients were robust. We also explored whether adding state-level variables at ages 20 and 40 improved the models or created multicollinearity issues, and concluded the latter.

Discussion

Recent studies have described how the importance of educational attainment for adult disability and mortality varies across U.S. states and regions but have not investigated explanations for the variation. The question remains, then, why education is more important in some areas of the country than in others. We used a contextual and life-course perspective to assess potential explanations rooted in childhood and adulthood.

We discuss three key findings. First, comporting with previous studies, the gradient differs across geographic areas of the country mainly because the health and longevity of low-educated adults differs (e.g., Montez, Hayward, et al. 2019; Montez, Zajacova, et al. 2019). With few exceptions, a bachelor's degree or higher was protective across regions for the measures of cardiometabolic morbidity, functioning, and mortality that we examined. Our findings agree with previous studies positing that higher educated adults can draw on their varied and deep bucket of social, economic, and lifestyle resources to protect, or insulate, themselves from the contexts in which they reside.

Second, the ways regions shape the gradient differ by health outcome. For instance, the association between education and both measures of functioning is especially strong and monotonic in all regions (although it is larger in some regions), while the association between education and morbidity is large in some regions but either small, nonexistent, or nonmonotonic in others. We offer no firm explanation for the peculiarly robust and monotonic gradient in mobility limitations and disability, but speculate that it may partly reflect the widespread exclusion of children with disabilities from schools when these cohorts were of school age. Before the 1975 enactment of the Education for All Handicapped Children Act (later renamed the Individuals with Disabilities Education Act), children with disabilities were routinely excluded from the American school system, particularly in some states, with only 20 percent of children with disabilities receiving a public education (West 2000). Consequently, a strong "selection" of HRS respondents with early-life mobility limitations or disabilities into the lower educated groups may undergird the gradients in functioning. Consistent with this speculation, the strong and monotonic gradients in functioning across regions were

more pronounced in the prevalence models than the incidence models. Further supporting this speculation, we found that childhood exposures (specifically childhood health, SES, and length of school year) provide a comparable explanation for the geographic pattern in the gradient for disability prevalence as did adulthood exposures.

Third, educational attainment appears to be more important for health in some areas of the country than in others, partly because of geographic differences in childhood socioeconomic conditions and health but mostly because of geographic differences in adult circumstances, particularly wealth, lifestyles, and economic and tobacco policies (the main exception, as we described earlier, is disability, for which childhood circumstances played a particularly important role). Indeed, geographic differences in wealth, lifestyles, and policies are well documented. For instance, during the lifetimes of our HRS cohorts, the West North Central region (with consistently small gradients) had low poverty rates and low income inequality, while the East South Central region (with large gradients for many outcomes) had the double disadvantage of high poverty rates and high income inequality (Mather and Jarosz 2016). Interestingly, state-level economic policies and conditions appear to be particularly critical when respondents were around the age of 30. In many ways, this makes sense. During this life-course stage, many of these adults were in the paid labor force, and many were raising children. Consequently, the availability of EITC, the level of minimum wage, and unemployment rates in their state of residence would be very salient and could exacerbate or attenuate the importance of education for economic well-being.

Taken together, our findings underscore the necessity of bringing context into conceptual frameworks and explanations for the gradient more generally. For example, we found that the gap in diabetes prevalence between low- and high-educated adults is a sizable 10 percentage points in the East North Central region (Wisconsin, Michigan, Illinois, Indiana, and Ohio) but is nonexistent in the West North Central region (North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri). In fact, West North Central has some of the smallest gradients for several of the outcomes, whereas no one region has a consistently large gradient for all of the outcomes. Our findings strongly suggest that context factors are prominent in explaining the gradient. Simply put, the factors that facilitate or hinder educational attainment, and the factors that shape the importance of attained education for avoiding risks and accessing resources for health, differ across contexts.

One caveat of our findings is that they may be specific to the birth cohorts in our study. Federal, state, and local contexts changed markedly during their lifetimes, and these conditions continue to be highly dynamic. In some ways, contexts have converged across the country. For instance, the 1975 federal enactment of what is now known as the Individuals with Disabilities Education Act mandates that students with disabilities be neither excluded nor segregated in the schooling system, which they often were in many states, even by law (West 2000). Between 1989 and 2010 to 2014, the percentage of counties with the double disadvantage of high poverty and high income inequality grew from 26 percent to 41 percent, spreading across the country. In other ways, however, contexts have diverged. As we mentioned earlier, the growing divergence in states' policy contexts has been pronounced during these cohorts' adult lives. Over the past 30 years, states such as Minnesota and New York have invested in their residents through policies such as EITCs, higher minimum wages, and higher tobacco taxes, whereas states such as Mississippi and Kentucky have deinvested and actively engaged in preemption strategies that remove local government authority to legislate on matters that could improve economic well-being and population health (Pomeranz and Pertschuk 2017). To the extent that recent birth cohorts have spent a lifetime in these disparate contexts, the importance of education for their health may differ across contexts in even stronger ways than it does for the HRS cohorts.

Limitations

Given the complexity of integrating life-course and geographic contexts in this study, there are several limitations to consider. Although we used a rich source of data that enabled linking individuals to their states of birth and residence at age 10 and during the study, for individuals who moved between ages 10 and 50, we did not have information on those intervening states. Our supplementary analyses using alternative interstate migration assumptions generally corroborated our conclusions. To the extent that we have misclassified the state of residence at age 30 among some of our respondents, coefficients for the state-level exposures and our conclusions about their importance are conservative. Nevertheless, some caution is warranted in interpreting our results.

In creating the compulsory schooling variable, we also had to make the assumption that parents were roughly 25 years older than their children. Although parents were likely younger among these generations when they had their first children, we were limited by the available data we have for the years 1910 to 1939. Because respondents in our sample were born from 1939 to 1964, the choice of 25 years allowed us to use the available data.

Given our sample size, we were also restricted to examining variation in the education-health association by region rather than state. Nevertheless, we measured the contextual variables at the state level. Our main conclusions are consistent with studies that examine the gradient by state. For instance, higher education acts as a "personal firewall" across regions, whereas adults with less than high school credentials have varying risks for poor health across regions. Also because of sample size, we did not examine the extent to findings may differ across sex or race.

Conclusion

The importance of education for avoiding risks and acquiring resources for health depends on where one lives. For the 1939 to 1964 birth cohorts in our study, educational attainment was more important for health in some areas of the United States than in others, partly because of geographic differences in childhood socioeconomic conditions and health but mostly because of geographic differences in adult circumstances, particularly wealth, lifestyles, and states' economic and tobacco control policies. Public health efforts to reduce educational disparities in health must consider the contexts that undergird the disparities.

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References

Baker, David P., William C. Smith, Ismael G. Muñoz, Haram Jeon, Tian Fu, Juan Leon, Daniel Salinas, and Renata Horvatek. 2017. "The Population Education Transition Curve: Education Gradients across Population Exposure to New Health Risks." *Demography* 54:1873–95.

Beckfield, Jason, Clare Bambra, Terje A. Eikemo, Tim Huijts, Courtney McNamara, and Claus Wendt. 2015. "An Institutional Theory of Welfare State Effects on the Distribution of Population Health." *Social Theory & Health* 13(3–4):227–44.

Beckfield, Jason, and Nancy Krieger. 2009. "Epi + Demos + Cracy: Linking Political Systems and Priorities to the Magnitude of Health Inequities—Evidence, Gaps, and a Research Agenda." *Epidemiologic Reviews* 31(1):152–77.

Bird, Chloe E., and Patricia P. Rieker. 2008. *Gender and Health: The Effects of Constrained Choices and Social Policies*. New York: Cambridge University Press.

Bureau of Labor Statistics. N.d. "Local Area Unemployment Statistics." Retrieved December 26, 2019. https://www.bls.gov/web/laus/laumstrk.htm.

Clouston, Sean A. P., Marcie S. Rubin, Jo C. Phelan, and Bruce G. Link. 2016. "A Social History of Disease: Contextualizing the Rise and Fall of Social Inequalities in Cause-Specific Mortality." *Demography* 53:1631–56.

Crimmins, Eileen M., and Caleb E. Finch. 2006. "Infection, Inflammation, Height, and Longevity." *Proceedings of the National Academy of Sciences* 103(2):498–503.

Crimmins, Eileen M., Yasuhiko Saito, Jung Ki Kim, Yuan S. Zhang, Isaac Sasson, and Mark D. Hayward. 2018. "Educational Differences in the Prevalence of Dementia and Life Expectancy with Dementia: Changes from 2000 to 2010." *Journal of Gerontology: Social Sciences* 73:S20–28.

Cutler, David, and Grant Miller. 2005. "The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States." *Demography* 42:1–22.

Dawson, Deborah A. 2011. "Defining Risk Drinking." *Alcohol Research and Health* 34(2):144–56.

Diderichsen, Finn, Timothy Evans, and Margaret Whitehead. 2001. "The Social Basis of Disparities in Health." Pp. 37–43 in *Challenging Inequities in Health: From Ethics to Action*, edited by T. Evans, M. Whitehead, F. Diderichsen, A. Bhuiya, and M. Wirth. New York: Oxford University Press.

Feldman, Jacob J., Diane M. Makuc, Joel C. Kleinman, and Joan Cornoni-Huntley. 1989. "National Trends in Educational Differentials in Mortality." *American Journal of Epidemiology* 129(5):919–33.

Ferraro, Kenneth F., Markus H. Schafe, and Lindsay R. Wilkinson. 2016. "Childhood Disadvantage and Health Problems in Middle and Later Life: Early Imprints on Physical Health?" *American Sociological Review* 81(1):107–33.

Galea, Sandro, Melissa Tracy, Katherine J. Hoggatt, Charles DiMaggio, and Adam Karpati. 2011. "Estimated Deaths Attributable to Social Factors in the United States." *American Journal of Public Health* 101(8):1456–65.

Goesling, Brian. 2007. "The Rising Significance of Education for Health." *Social Forces* 85(4):1621–44.

Goldin, Claudia, and Lawrence Katz. 2003. "Mass Secondary Schooling and the State." NBER Working Paper No. 10075. Cambridge, MA: National Bureau of Economic Research.

Goldin, Claudia, and Lawrence F. Katz. 2011. "Mass Secondary Schooling and the State: The Role of State Compulsion in the High School Movement." Pp. 275–310 in *Understanding Long-Run Economic Growth: Geography, Institutions, and the Knowledge Economy*, edited by D. L. Costa, and N. R. Lamoreaux. Chicago: University of Chicago Press and NBER.

Hayward, Mark D., and Bridget K. Gorman. 2004. "The Long Arm of Childhood: The Influence of Early-Life Social Conditions on Men's Mortality." *Demography* 41:87–107.

Hayward, Mark D., Robert A. Hummer, and Isaac Sasson. 2015. "Trends and Group Differences in the Association between Educational Attainment and U.S. Adult Mortality: Implications for Understanding Education's Causal Influence." *Social Science & Medicine* 127(1):8–18.

Karahan, Faith, and Darius Li. 2016. "What Caused the Decline in Interstate Migration in the United States?" Federal Reserve Bank of New York. Retrieved December 26, 2019. https://libertystreeteconomics.newyorkfed.org/2016/10/what-caused-the-decline-in-interstate-migration-in-the-united-states.html.

Kemp, Blakelee R., Kenneth F. Ferraro, Patricia M. Morton, and Sarah A. Mustillo. 2018. "Early Origins of Adult Cancer Risk among Men and Women: Influence of Childhood Misfortune?" *Journal of Aging and Health* 30(1):140–63.

Knol, Mirjan J., Wiebe R. Pestman, and Diederick E. Grobbee. 2011. "The (Mis) Use of Overlap of Confidence Intervals to Assess Effect Modification." *European Journal of Epidemiology* 26(4):253–254.

Link, Bruce G., and Jo Phelan. 1995. "Social Conditions as Fundamental Causes of Disease." *Journal of Health and Social Behavior* Extra Issue:80–94.

Lynch, Scott M. 2006. "Explaining Life Course and Cohort Variation in the Relationship between Education and Health: The Role of Income." *Journal of Health and Social Behavior* 47(4):324–38.

Masters, Ryan K., Robert A. Hummer, and Daniel A. Powers. 2012. "Educational Differences in U.S. Adult Mortality: A Cohort Perspective." *American Sociological Review* 77(4): 548–72.

Mather, Mark, and Beth Jarosz. 2016. "Poverty and Inequality Pervasive in Two-Fifths of U.S. Counties: Population Reference Bureau." Retrieved December 26, 2019. https://www.prb.org/poverty-and-inequality-us-counties/.

Mirowsky, John, and Catherine E. Ross. 1998. "Education, Personal Control, Lifestyle and Health: A Human Capital Hypothesis." *Research on Aging* 20(4):415–49.

Mirowsky, John, and Catherine E. Ross. 2007. "Creative Work and Health." *Journal of Health and Social Behavior* 48(4) :385–403.

Montez, Jennifer Karas. 2017. "Deregulation, Devolution, and State Preemption Laws' Impact on U.S. Mortality Trends." *American Journal of Public Health* 107(11):1749–50.

Montez, Jennifer Karas, and Mark D. Hayward. 2014. "Cumulative Childhood Adversity, Educational Attainment, and Active Life Expectancy among U.S. Adults." *Demography* 51:413–35.

Montez, Jennifer Karas, Mark D. Hayward, and Anna Zajacova. 2019. "Educational Disparities in U.S. Adult Health: U.S. States as Institutional Actors on the Association." *Socius* 5(1):1–14.

Montez, Jennifer Karas, Anna Zajacova, and Mark D. Hayward. 2017. "Disparities in Disability by Educational Attainment across U.S. States." *American Journal of Public Health* 107(7):1101–1108.

Montez, Jennifer Karas, Anna Zajacova, Mark D. Hayward, Steven Woolf, Derek Chapman, and Jason Beckfield. 2019. "Educational Disparities in Adult Mortality across U.S. States: How Do They Differ and Have They Changed since the Mid-1980s?" *Demography* 56:621–44.

Muennig, Peter A., Babak Mohit, Jinjing Wu, Haomiao Jia, and Zohn Rosen. 2016. "Cost Effectiveness of the Earned Income Tax Credit as a Health Policy Investment." *American Journal of Preventive Medicine* 51(6):874–81.

National Center for Health Statistics. 2015. "Vital Statistics of the United States: 1939–1964." Retrieved December 26, 2019. https://www.cdc.gov/nchs/products/vsus/vsus_1939_1964.htm.

Oreopoulos, Philip, Marianne E. Page, and Ann Huff Stevens. 2006. "The Intergenerational Effects of Compulsory Schooling." *Journal of Labor Economics* 24(4):729–60.

Orzechowski, Bill, and Rob Walker. 2014. "The Tax Burden on Tobacco. Historical Compilation." Volume 49. Arlington, VA: Orzechowski & Walker Consulting.

Pampel, Fred C., Patrick M. Krueger, and Justin T. Denney. 2010. "Socioeconomic Disparities in Health Behaviors." *American Review of Sociology* 36:349–70.

Pomeranz, Jennifer L., and Mark Pertschuk. 2017. "State Preemption: A Significant and Quiet Threat to Public Health in the United States." *American Journal of Public Health* 107(6):900–902.

Ross, Catherine E., and Chia-Ling Wu. 1995. "The Links between Education and Health." *American Sociological Review* 60(5):719–45.

Sasson, Isaac. 2016. "Trends in Life Expectancy and Lifespan Variation by Educational Attainment: United States, 1990–2010." *Demography* 53:269–93.

Schafer, Markus H., Lindsay R. Wilkinson, and Kenneth F. Ferraro. 2013. "Childhood (Mis) Fortune, Educational Attainment, and Adult Health: Contingent Benefits of a College Degree?" *Social Forces* 91(3):1007–34.

Sheehan, Connor, Jennifer Karas Montez, and Isaac Sasson. 2018. "Does the Functional Form of the Association between Education and Mortality Differ by U.S. Region?" *Biodemography and Social Biology* 64(1):63–81.

Skinner, Jonathan, and Douglas Staiger. 2007. "Technology Adoption from Hybrid Corn to Beta-Blockers." Pp. 545–70 in *Hard-to-Measure Goods and Services: Essays in Honor of Zvi Griliches*, edited by E. R. Berndt, and C. R. Hulten. Chicago: University of Chicago Press.

Spector, William D., and John A. Fleishman. 1998. "Combining Activities of Daily Living with Instrumental Activities of Daily Living to Measure Functional Disability." *Journals of Gerontology: Social Sciences* 53B:S46–57.

Tauras, John A. 2004. "Public Policy and Smoking Cessation among Young Adults in the United States." *Health Policy* 68(3):321–22.

Vaghul, Kavya, and Ben Zipperer. 2016. "Historical State and Sub-state Minimum Wage Data." Washington Center for Equitable Growth. Retrieved December 26, 2019. https://equitable-growth.org/working-papers/historical-state-and-sub-state-minimum-wage-data/.

Van Dyke, Miriam E., Kelli A. Komro, Monica P. Shah, Melvin D. Livingston, and Michael R. Kramer. 2018. "State-Level Minimum Wage and Heart Disease Death Rates in the United States, 1980–2015: A Novel Application of Marginal Structural Modeling." *Preventive Medicine* 112(1):97–103.

Verbrugge, Lois M., and Alan M. Jette. 1994. "The Disablement Process." *Social Science & Medicine* 38(1):1–14.

West, Jane. 2000. "Back to School on Civil Rights: Advancing the Federal Commitment to Leave No Child Behind." National Council on Disabilty. Retrieved December 26, 2019. https://files.eric.ed.gov/fulltext/ED438632.pdf.

Zajacova, Anna, and Elizabeth M. Lawrence. 2018. "The Relationship between Education and Health: Reducing Disparities through a Contextual Approach." *Annual Review of Public Health* 39:273–89.

Zajacova, Anna, and Jennifer Karas Montez. 2018. "Explaining the Increasing Disability Prevalence among Mid-life U.S. Adults, 2002–2016." *Social Science & Medicine* 211(1):1–8.

Zhang, Zhenmei, and Mark D. Hayward. 2006. "Gender, the Marital Life Course, and Cardiovascular Disease in Late Midlife." *Journal of Marriage and Family* 68(3):639–57.

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