ANNUAL REVIEWS

Annual Review of Public Health

The Relationship Between Education and Health: Reducing Disparities Through a Contextual Approach

Anna Zajacova[1] and Elizabeth M. Lawrence[2]

[1]Department of Sociology, Western University, London, Ontario N6A 5C2, Canada; email: anna.zajacova@uwo.ca

[2]Department of Sociology, University of Nevada, Las Vegas, Nevada 89154, USA; email: lizlaw@unc.edu

ANNUAL REVIEWS **Further**

Click here to view this article's online features:

- Download figures as PPT slides
- Navigate linked references
- Download citations
- Explore related articles
- Search keywords

Annu. Rev. Public Health 2018. 39:273–89

First published as a Review in Advance on January 12, 2018

The *Annual Review of Public Health* is online at publhealth.annualreviews.org

https://doi.org/10.1146/annurev-publhealth-031816-044628

Copyright © 2018 Anna Zajacova & Elizabeth M. Lawrence. This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See credit lines of images or other third-party material in this article for license information

OPEN ACCESS CC BY

Keywords

education, health, US adults, causality, social context, policy

Abstract

Adults with higher educational attainment live healthier and longer lives compared with their less educated peers. The disparities are large and widening. We posit that understanding the educational and macrolevel contexts in which this association occurs is key to reducing health disparities and improving population health. In this article, we briefly review and critically assess the current state of research on the relationship between education and health in the United States. We then outline three directions for further research: We extend the conceptualization of education beyond attainment and demonstrate the centrality of the schooling process to health; we highlight the dual role of education as a driver of opportunity but also as a reproducer of inequality; and we explain the central role of specific historical sociopolitical contexts in which the education–health association is embedded. Findings from this research agenda can inform policies and effective interventions to reduce health disparities and improve health for all Americans.

URGENT NEED FOR NEW DIRECTIONS IN EDUCATION–HEALTH RESEARCH

Americans have worse health than people in other high-income countries and have been falling further behind in recent decades (137). This pattern is partially due to the large health inequalities and poor health of adults with low education (84). Understanding the health benefits of education is thus integral to reducing health disparities and improving the well-being of twenty-first-century populations. Despite extensive prior research, critical questions about the education–health relationship remain unanswered, in part because education and health are intertwined over the life spans within and across generations and are inextricably embedded in the broader social context.

We posit that to inform future educational and heath policy effectively, we need to capture education in action as it generates and constrains opportunity during the early life spans of today's cohorts. First, we need to expand our operationalization of education beyond attainment to consider the long-term educational process that precedes the attainment and its effect on health. Second, we need to reconceptualize education not only as a vehicle for social success, valuable resources, and good health, but also as an institution that reproduces inequality across generations. And third, we argue that investigators need to bring historical, social, and policy contexts into the heart of analyses: How does the education–health association vary across place and time, and how do political forces influence that variation?

During the past several generations, education has become the principal pathway to financial security, stable employment, and social success (8). At the same time, American youth have experienced increasingly unequal educational opportunities that depend on the schools they attend, the neighborhoods in which they live, the color of their skin, and families' financial resources. The decline in manufacturing and rise of globalization have eroded the middle class, while the increasing returns to higher education magnified the economic gaps among working adults and families (107). In addition to these dramatic structural changes, policies that protected the welfare of vulnerable groups have been gradually eroded or dismantled (129). Together, these changes triggered a precipitous growth of economic and social inequalities in the American society (17, 106).

Unsurprisingly, health disparities grew along with the socioeconomic inequalities. Although the average health of the US population improved over the past decades (67, 85), the gains largely went to the most educated groups. Inequalities in health (53, 77, 99) and mortality (86, 115) increased steadily, to a point where we now see an unprecedented pattern: Health and longevity are deteriorating among those with less education (92, 99, 121, 143). With the current focus of the media, policy makers, and the public on the worrisome health patterns among less educated Americans (28, 29), as well as the growing recognition of the importance of education for health (84), research on the health returns to education is at a critical juncture. A comprehensive research program is needed to understand how education and health are related in order to identify effective points of intervention to improve population health and reduce disparities.

The article is organized in two parts. First, we review the current state of research on the relationship between education and health. In broad strokes, we summarize the theoretical and empirical foundations of the education–health relationship and critically assess the literature on the mechanisms and causal influence of education on health. In the second part, we highlight gaps in knowledge and propose new directions for innovative research that will fill these gaps. The enormous breadth of the literature on education and health necessarily limits the scope of the review in terms of place and time; we focus on the United States and on findings generated during the rapid expansion of the education–health research in the past 10–15 years. The terms "education" and "schooling" are used interchangeably. Unless we state otherwise, both refer to

attained education, whether measured in completed years or in credentials. For references, we include prior review articles where available, seminal papers, and recent studies as the most useful starting points for further reading.

THE ASSOCIATION BETWEEN EDUCATION AND HEALTH

Conceptual Toolbox for Examining the Association

Researchers have generally drawn from three broad theoretical perspectives to hypothesize the relationship between education and health. Much of the education–health research over the past two decades has been grounded in the fundamental cause theory (FCT) (75). The FCT posits that social factors such as education are fundamental causes of health and disease because they determine access to a multitude of material and nonmaterial resources such as income, safe neighborhoods, or healthier lifestyles, all of which protect or enhance health. The multiplicity of pathways means that even as some mechanisms change or become less important, other mechanisms will continue to channel the social dis/advantages into differential health (48). The human capital theory (HCT), borrowed from econometrics, conceptualizes education as an investment that yields returns via increased productivity (12). Education improves individuals' knowledge, skills, reasoning, effectiveness, and a broad range of other abilities, which can be utilized to produce health (93). The third approach, the signaling or credentialing perspective (34, 125), has been used to explain the observed large discontinuities in health at 12 and 16 years of schooling, typically associated with the receipt of a high school diploma and a college degree, respectively. This perspective views earned credentials as a potent signal about one's skills and abilities and emphasizes the economic and social returns to such signals. Thus all three perspectives postulate a causal relationship between education and health and identify numerous mechanisms through which education influences health. The HCT specifies the mechanisms as embodied skills and abilities, FCT emphasizes the dynamism and flexibility of mechanisms, and credentialism identifies social responses to educational attainment. All three theoretical approaches, however, operationalize the complex process of schooling solely in terms of attainment and thus do not focus on differences in educational quality, type, or other institutional factors that might independently influence health. They also focus on individual-level factors—individual attainment, attainment effects, and mechanisms—and leave out the social context in which the education and health processes are embedded.

Observed Associations Between Education and Health

Empirically, hundreds of studies have documented "the gradient" whereby more schooling is linked with better health and longer life. A seminal 1973 book by Kitagawa & Hauser (71) powerfully described large differences in mortality by education in the United States, a finding that has since been corroborated in numerous studies (31, 42, 46, 109, 124). In the following decades, nearly all health outcomes were also found to be strongly patterned by education. Less educated adults report worse general health (94, 141), more chronic conditions (68, 108), and more functional limitations and disability (118, 119, 130, 143). Objective measures of health, such as biological risk levels, are similarly correlated with educational attainment (35, 90, 140), showing that the gradient is not a function of differential reporting or knowledge.

The gradient is evident in men and women (139) and among all race/ethnic groups (36). However, meaningful group differences exist (60, 62, 91). In particular, education appears to have stronger health effects for women than men (111) and stronger effects for non-Hispanic whites than minority adults (134, 135), even if the differences are modest for some health outcomes (36).

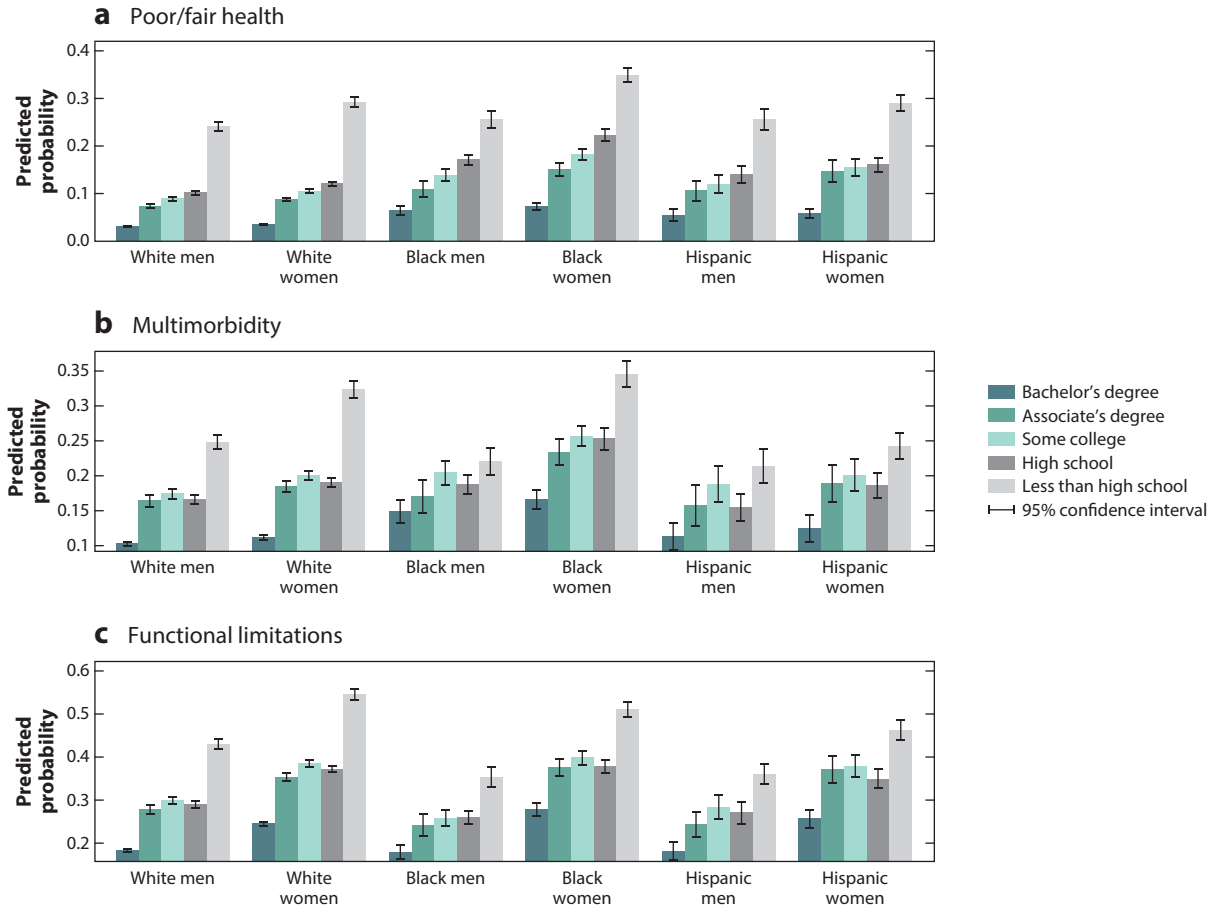


Figure 1

Predicted probability of health problems. Data from 2002–2016 NHIS Survey, Adults Age 25–64.

The observed variations may reflect systematic social differences in the educational process such as quality of schooling, content, or institutional type, as well as different returns to educational attainment in the labor market across population groups (26). At the same time, the groups share a common macrolevel social context, which may underlie the gradient observed for all.

To illustrate the gradient, we analyzed 2002–2016 waves of the National Health Interview Survey (NHIS) data from adults aged 25–64. **Figure 1** shows the levels of three health outcomes across educational attainment levels in six major demographic groups predicted at age 45. Three observations are noteworthy. First, the gradient is evident for all outcomes and in all race/ethnic/gender groups. Self-rated health exemplifies the staggering magnitude of the inequalities: White men and women without a high school diploma have roughly a 57% chance of reporting fair or poor health, compared with only a 9% chance among college graduates. Second, there are major group differences as well, both in the predicted levels of health problems and in the education effects. The latter are not necessarily visible in the figures, but the education effects are stronger for women and weaker for nonwhite adults as shown in prior studies (a table with regression model results underlying the prior statement is available from the authors upon request). Third, an intriguing

exception pertains to adults with "some college," whose health is similar to that of high school graduates in terms of health outcomes other than general health, despite their investment in and exposure to postsecondary education. We discuss this anomaly below.

Pathways Through Which Education Impacts Health

What explains the health and longevity of more educated adults? The most prominent mediating mechanisms can be grouped into four categories: economic, health-behavioral, social-psychological, and access to health care. Education leads to better, more stable jobs that pay higher income and allow families to accumulate wealth that can be used to improve health (93). The economic factors are an important link between schooling and health, estimated to account for about 30% of the correlation (36). Health behaviors are undoubtedly an important proximal determinant of health, but they explain only a part of the effect of schooling on health: Adults with less education are more likely to smoke, have an unhealthy diet, and lack exercise (37, 73, 105, 117). Social-psychological pathways include successful long-term marriages and other sources of social support to help cope with stressors and daily hassles (128, 131). Access to health care, while important to individual and population health overall, has a modest role in explaining health inequalities by education (61, 112, 133), highlighting the need to look upstream beyond the health care system toward social factors that underlie social disparities in health. Beyond these four groups of mechanisms that have received the most attention by investigators, many others have been examined, such as stress, cognitive and noncognitive skills, or environmental exposures (11, 43). Several excellent reviews further discuss mechanisms (2, 36, 66, 70, 93).

Causal Interpretation of the Education–Health Association

A burgeoning number of studies used innovative approaches such as natural experiments and twin design to test whether and how education causally affects health. These analyses are essential because recommendations for educational policies, programs, and interventions seeking to improve population health hinge on the causal impact of schooling on health outcomes. Overall, this literature shows that attainment, measured mostly in completed years of schooling, has a causal impact on health across numerous (though not all) contexts and outcomes.

Natural experiments take advantage of external changes that affect attainment but are unrelated to health, such as compulsory education reforms that raise the minimum years of schooling within a given population. A seminal 2005 study focused on increases in compulsory education between 1915 and 1939 across US states and found that an additional year of schooling reduced mortality by 3.6% (78). A reanalysis of the data indicated that accounting for state-level mortality trends rendered the mortality effects null, but instead it identified a significant and large causal effect on general health (88). A recent study of a large sample of older Americans reported a similar pattern: a substantial causal effect of education for self-rated health but not for mortality (47). School reform studies outside the United States have reported compelling (122) or modest but significant (32) effects of schooling on health, although some studies have found nonsignificant (4) or even negative effects (7) for a range of health outcomes.

Twin design studies compare the health of twins with different levels of education. This design minimizes the influence of family resources and genetic differences in skills and health, especially for monozygotic twins, and thus serves to isolate the effect of schooling. In the United States, studies using this design generated robust evidence of a causal effect of education on self-rated health (79), although some research has identified only modest (49) or nonsignificant (3, 55) effects for other physical and mental health outcomes. Studies drawing on the large twin samples outside

of the United States have similarly found strong causal effects for mortality (80) and health (14, 16, 51), but again some analyses yielded no causal effects on health (13, 83) or health behaviors (14). Beyond our brief overview, readers may wish to consult additional comprehensive reviews of the causal studies (40, 45, 89).

The causal studies add valuable evidence that educational attainment impacts adult health and mortality, even considering some limitations to their internal and external validity (15, 88). To improve population health and reduce health disparities, however, they should be viewed as a starting point for further research. First, the findings do not show how to improve the quality of schooling or its quantity in the aggregate population or how to overcome systematic intergenerational and social differences in educational opportunities. Second, their findings do not take into account contexts and conditions in which educational attainment might be particularly important for health. In fact, the variability in the findings may be attributable to the stark differences in contexts across the studies, which include countries characterized by different political systems, different population groups, and birth cohorts ranging from the late nineteenth to late twentieth centuries that were exposed to education at very different stages of the educational expansion process (9).

TOWARD A SOCIALLY EMBEDDED UNDERSTANDING OF THE EDUCATION–HEALTH RELATIONSHIP

The extensive research we briefly reviewed above has identified substantial health benefits of educational attainment in most contexts in today's high-income countries. Still, many important questions remain unanswered. We outline three critical directions to gain a deeper understanding of the education–health relationship with particular relevance for policy development. All three directions shift the education–health paradigm to consider how education and health are embedded in life course and social contexts.

First, nearly universally, the education–health literature conceptualizes and operationalizes education in terms of attainment, as years of schooling or completed credentials. However, attainment, although undoubtedly important, is only the end point of an extended and extensive process of formal schooling, where institutional quality, type, content, peers, teachers, and many other individual, institutional, and interpersonal factors shape life course trajectories of schooling and health. Understanding the role of the schooling process in health outcome is relevant for policy because it can show whether interventions should be aimed at increasing attainment, or whether it is more important to increase quality, change content, or otherwise improve the educational process at earlier stages for maximum health returns. Second, most studies have implicitly or explicitly treated educational attainment as an exogenous starting point, a driver of opportunities in adulthood. However, education also functions to reproduce inequality across generations. The explicit recognition of the dual function of education is critical to developing education policies that would avoid the unintended consequence of increasing inequalities. And third, the review above indicates substantial variation in the education–health association across different historical and social contexts. Education and health are inextricably embedded in these contexts, and analyses should therefore include them as fundamental influences on the education–health association. Research on contextual variation has the potential to identify contextual characteristics that matter most and even specific policies that exacerbate or reduce educational disparities in health.

We illustrate the key conceptual components of future research into the education–health relationship in **Figure 2**. Important intergenerational and individual sociodemographic factors shape educational opportunities and educational trajectories, which are directly related to and captured in measures of educational attainment. This longitudinal and life course process culminates in

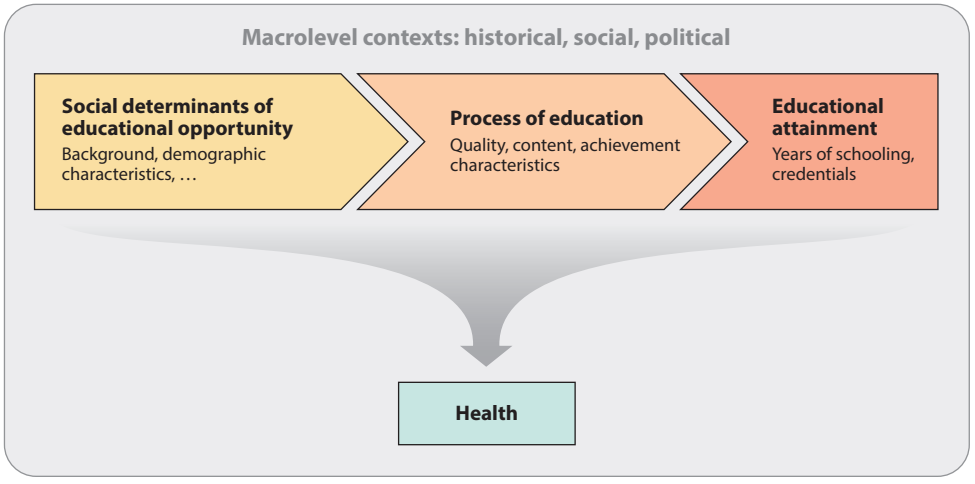


Figure 2

Macrolevel contexts: historical, social, political.

educational disparities in adult health and mortality. The macrolevel context underlies every step of this process, shaping each of the concepts and their relationships.

Enriching the Conceptualization of Educational Attainment

In most studies of the education–health associations, educational attainment is modeled using years of schooling, typically specified as a continuous covariate, effectively constraining each additional year to have the same impact. A growing body of research has substituted earned credentials for years. Few studies, however, have considered how the impact of additional schooling is likely to differ across the educational attainment spectrum. For example, one additional year of education compared with zero years may be life-changing by imparting basic literacy and numeracy skills. The completion of 14 years rather than 13 (without the completion of an associate's degree) could be associated with better health through the accumulation of additional knowledge and skills as well, or perhaps could be without health returns, if it is associated with poor grades, stigma linked to dropping out of college, or accumulated debt (63, 76). Examining the functional form of the education–health association can shed light on how and why education is beneficial for health (70). For instance, studies found that mortality gradually declines with years of schooling at low levels of educational attainment, with large discontinuities at high school diploma and college degree attainment (56, 98). Such findings can point to the importance of completing a degree, not just increasing the quantity (years) of education. Examining mortality, however, implicitly focused on cohorts who went to school 50–60 years ago, within very different educational and social contexts. For findings relevant to current education policies, we need to focus on examining more recent birth cohorts.

A particularly provocative and noteworthy aspect of the functional form is the attainment group often identified as "some college": adults who attended college but did not graduate with a four-year degree. Postsecondary educational experiences are increasingly central to the lives of American adults (27), and college degree completion has become the minimum requirement for entry into middle class (65, 87). More than 70% of high school graduates enroll in college (22), but the majority never earn a four-year degree (113). In fact, the largest education-attainment

group among nonelderly US adults comprises the 54 million adults (29% of the total) with some college or an associate's degree (113). However, as shown in **Figure 1**, this group often defies the standard gradient in health. Several recent studies have found that the health returns to their postsecondary investments are marginal at best (110, 123, 142, 144). This finding should spur new research to understand the outcomes of this large population group and to glean insights into the health returns to the postsecondary schooling process. For instance, in the absence of earning a degree, is greater exposure to college education in terms of semesters or earned credits associated with better health or not? How do the returns to postsecondary schooling differ across the heterogeneous institutions ranging from selective four-year to for-profit community colleges? How does accumulated college debt influence both attrition and later health? Can we identify circumstances under which some college education is beneficial for health? Understanding the health outcomes for this attainment group can shed light on the aspects of education that are most important for improving health.

A related point pertains to the reliability and validity of self-reported educational attainment. If a respondent reports 16 completed years of education, for example, are they carefully counting the number of years of enrollment, or is 16 years shorthand for "completed college"? Is 16 years the best indicator of college completion in the current context when the median time to earn a four-year degree exceeds 5 years (30)? If we look only at adults with a degree, should we expect that those who took longer to earn the degree would have greater health benefits due to the longer exposure to schooling, or does it instead signify delayed or disrupted educational pathways linked to weaker health benefits (132)? How should we measure part-time enrollment? As studies begin to adjudicate between the health effects of years versus credentials (74) in the changing landscape of increasingly diverse pathways through college (132), this measurement work will be necessary for unbiased and meaningful analyses. An in-depth understanding may necessitate primary data collection and qualitative studies. A feasible research direction available with existing data such as the National Longitudinal Survey of Youth 1997 (NLSY97) is to assess the health effects of earned college credits and grades rather than years of education beyond high school.

As indicated in **Figure 2**, beyond a more in-depth usage of the attainment information, we argue that a more effective conceptualization of the education–health relationship as a developmental life course process will lead to important findings. For instance, two studies published in 2016 used the NLSY97 data to model how gradual increases in education predict within-individual changes in health (39, 81). Both research teams found that gradual accumulation of schooling quantity over time was not associated with gradual improvements in health. The investigators interpreted the null findings as an absence of causal effects of education on health, especially once they included important confounders (defined as cognitive and noncognitive skills and social background). Alternatively, perhaps the within-individual models did not register health because education is a long-term developmental trajectory that cannot be reduced to point-in-time changes in exposure. Notwithstanding criticisms about the technical aspects of these studies (59), we believe that these studies and others like them, which wrestle with the question of how to capture education as a long-term process grounded in the broader social context, and how this process is linked to adult health, are desirable and necessary.

Education as (Re)producer of Inequality

The predominant theoretical framework for studying education and health focuses on how education increases skills, improves problem-solving, enhances employment prospects, and thus opens access to other resources. In sociology, however, education is viewed not (only) as increasing human capital but as a "sieve" more than a ladder (126, p. 129), an institution that reproduces

inequality across generations (54, 65, 103, 114). The mechanisms of the reproduction of inequality are multifarious, encompassing systematic differences in school resources, quality of instruction, academic opportunities, peer influences, or teacher expectations (54, 114, 132). The dual role of education, both engendering and constraining social opportunities, has been recognized from the discipline's inception (52) and has remained the dominant perspective in the sociology of education (18, 126). Health disparities research, which has largely dismissed this perspective as "specious" (93), could benefit from pivoting toward this complex sociological paradigm.

As demonstrated in **Figure 2**, parental socioeconomic status (SES) and other background characteristics are key social determinants that set the stage for one's educational experiences (20, 120). These characteristics, however, shape not just attainment, but the entire educational and social trajectories that drive and result in particular attainment (21, 69). Their effects range from the differential quality and experiences in daycare or preschool settings (6), K–12 education (24, 136), and postsecondary schooling (5, 127). As a result of systematically different schooling experiences over the early life course stratified by parental SES, children of low educated parents are unlikely to complete higher education: More than half of individuals with college degrees by age 24 came from families in the top quartile of family income compared with just 10% in the bottom quartile (23).

Unfortunately, prior research has generally operationalized the differences in educational opportunities as confounders of the education–health association, as selection bias to be statistically controlled, or at best as a moderating influence (10, 19). Rather than remove the important life course effects from the equation, studies that seek to understand how educational and health differences unfold over the life course, and even across generations, could yield greater insight (50, 70). A life course, multigenerational approach can provide important recommendations for interventions seeking to avoid the unintended consequence of increasing disparities. Insofar as socially advantaged individuals are generally better positioned to take advantage of interventions, research findings can be used to ensure that policies and programs result in decreasing, rather than unintentionally widening, educational and health disparities.

Education and Health in Social Context

Finally, perhaps the most important and policy-relevant emerging direction to improving our understanding of the education–health relationship is to view both as inextricably embedded within the broad social context. As we highlight in **Figure 2**, this context underlies every feature of the development of educational disparities in health. In contrast with the voluminous literature focusing on individual-level schooling and health, there has been a "startling lack of attention to the social/political/economic context" in which the relationships are grounded (33, p. 136). By context, we mean the structure of a society that varies across time and place, encompassing all major institutions and policy environments, as well as gender, race/ethnicity, age, and socioeconomic stratification. Under which circumstances, conditions, and policies are the associations between education and health stronger or weaker?

Within the United States, the most relevant units of geopolitical boundaries generating distinct policy contexts are states, although smaller geographic units are also pertinent (44, 100). Since the 1980s, the federal government has devolved an increasing range of key socioeconomic, political, and health care decisions to states. This decentralization has resulted in increasing diversity across states in conditions for a healthy life (96, 101). A recent study demonstrated how different environments across US states yield vastly different health returns to education (100). State-level characteristics had little impact on adults with high education, whose disability levels were similarly low regardless of their state of residence. In contrast, disability levels of less educated adults

were high, but they also varied substantially across states: Disability was particularly high in states that have invested less in the social welfare of its residents, such as Mississippi, Kentucky, and West Virginia. Highly educated adults, particularly white adults and men who can convert education into other resources most readily, use personal resources to protect their health like a "personal firewall" (97). Their less educated peers, meanwhile, are vulnerable without social safety nets. Demonstrating the potential for informing policy in this area, the findings directly identify state policies that influence the extent to which educational attainment matters for health and longevity. These include economic policies such as state income tax structures and education expenditures per capita, as well as policies that influence social cohesion in a state, such as income inequality and unemployment rates. Beyond the United States, investigators can leverage differences in political systems across countries to assess the impact of different welfare regimes on the education–health associations, as some European researchers have begun generating (41, 82).

Research on variation across time, similar to variation across geopolitical boundaries, can highlight policies and conditions that mitigate or inflate health disparities. How has the education–health association changed over time? In recent decades, the association has become increasingly strong, with widening disparities in health outcomes across education (53, 77, 86, 116, 143). These increases started in the 1980s (17) at the same time that social inequality began rising with the political embrace of promarket neoliberal policies (33). Since then, the United States has been increasingly marked by plummeting economic well-being (except for the wealthiest Americans), growing economic segregation, mass incarceration, downward social mobility, and despair in many working-class communities (17, 95, 129). Conversely, in the prior two decades (the 1960s and 1970s), social disparities in health were decreasing (1, 72). During those decades, many prosocial policies such as civil rights legislation, War on Poverty programs, and racial desegregation were improving social inequalities. Macrolevel political forces, clearly, can influence not only social but also health inequalities (104). Two corollaries follow: Growing disparities are not inevitable, and changes in the education–health relationship may be strongly linked to social policies. Although some of the growth in educational inequalities may be attributable to changes in the population's educational composition, with increasingly negatively select groups of adults at the lowest levels of schooling, these compositional changes likely play only a minor role in the overall trends (38, 58). Linking education and health to the broader social context brings to the forefront the ways in which we, as individuals and as a society, collectively produce and maintain health disparities.

Implications for Policy and Practice

Reducing macrolevel inequalities in health will require macrolevel interventions. Technological progress and educational expansion over the past several decades have not decreased disparities; on the contrary, educational disparities in health and mortality have grown in the United States. Moreover, the consistent, durable relationship between education and health and the multitude of mechanisms linking them suggest that programs targeting individual behaviors will have limited impact to counteract disparities. Thus, we argue that future findings from the new research directions proposed here can be used to intervene at the level of social contexts to alter educational trajectories from an early age, with the ultimate goal of reducing health disparities. We note two promising avenues for policy development.

One potential solution may focus on universal federal and state-level investment in the education and well-being of children early in the life course to disrupt the reproduction of social inequalities and to change subsequent educational trajectories. Several experimental early-education programs such as the Perry Preschool Project and Carolina Abecedarian Project have demonstrated substantial, lasting, and wide-ranging benefits, including improved adult health (25, 57, 102).

These programs provided intensive, exceptionally high-quality, and diverse services to children, and it is these characteristics that appear central to the programs' success (138). Further research on the qualitative and social dimensions of education and their effects on health can inform future model educational programs and interventions across all ages.

Another important issue for both researchers and policy makers pertains to postsecondary enrollment and attrition and their effects on health. Educational expansion in the college-for-all era has yielded high postsecondary enrollment but also unacceptable dropout rates with multiple detrimental consequences, including high rates of student debt (64) and stigma (76), which may negatively affect health. Emerging studies found that college dropouts fail to benefit from their postsecondary investments. Next, we need to understand under which circumstances college goers reap health benefits or how we can modify their postsecondary experience to improve their health.

For both of these avenues, effective implementation will need further research on the specific institutional characteristics and social contexts that shape the schooling effects. However, in designing interventions and policies, we need to be aware of the dual role of education as a driver of opportunity but also a reproducer of inequality. Individuals from advantaged backgrounds may be better positioned to take advantage of new educational opportunities, and thus any interventions and programs need to ensure that marginalized populations have equal or greater access in order to avoid the unintended consequence of further intensifying disparities. Finally, researchers and policy makers should engage in a dialogue such that researchers effectively communicate their insights and recommendations to policy makers and policy makers convey the needs and challenges of their practices to researchers.

CONCLUSION

Education and health are central to individual and population well-being. They are also inextricably embedded in the social context and structure. Future research needs to expand beyond the individual-focused analyses and hypothesize upstream (96), taking a contextual approach to understanding education and health. Such an approach will require interdisciplinary collaborations, innovations in conceptual models, and rich data sources. The three directions for further research on health returns to education outlined above can help generate findings that will inform effective educational and health policies and interventions to reduce disparities. During this critical time when health differences are widening and less educated Americans are experiencing economic and health declines, research and policy have the opportunity to make a difference and improve the health and well-being of our population.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

This work was supported in part by funding from the National Institutes of Health NIA Grant 5R03AG050130 to Zajacova, NICHD Ruth L. Kirschstein National Research Service Award F32 HD 085599 to Lawrence, and Carolina Population Center Grant P2C HD050924. We also express our gratitude to colleagues who offered insightful comments on earlier versions of the manuscript (in alphabetical order): Kate H. Choi, Jennifer B. Dowd, Robert A. Hummer, Rachel Margolis, Fred C. Pampel, Amanda M. Simanek, Zachary Zimmer, and the anonymous reviewer.

LITERATURE CITED

1. Adler NE, Cutler DM, Fielding JE, Galea S, Glymour MM, et al. 2016. *Addressing social determinants of health and health disparities*. Disc. Pap., Sept 19, Natl. Acad. Med. Vital Dir. Health Health Care, Washington, DC. **https://nam.edu/wp-content/uploads/2016/09/Addressing-Social-Determinants-of-Health-and-Health-Disparities.pdf**
2. Adler NE, Ostrove JM. 1999. Socioeconomic status and health: what we know and what we don't. *Ann. N. Y. Acad. Sci.* 896:3–15
3. Amin V, Behrman JR, Kohler H-P. 2015. Schooling has smaller or insignificant effects on adult health in the US than suggested by cross-sectional associations: new estimates using relatively large samples of identical twins. *Soc. Sci. Med.* 127:181–89
4. Arendt JN. 2005. Does education cause better health? A panel data analysis using school reforms for identification. *Econ. Educ. Rev.* 24:149–60
5. Armstrong EA, Hamilton LT. 2013. *Paying for the Party*. Cambridge, MA: Harvard Univ. Press
6. Augustine JM, Cavanagh SE, Crosnoe R. 2009. Maternal education, early child care and the reproduction of advantage. *Soc. Forces* 88:1–29
7. Avendano M, de Coulon A, Nafilyan V. 2017. *Does more education always improve mental health? Evidence from a British compulsory schooling reform*. Work. Pap., Health, Econom. Data Group, Dep. Econ., Univ. York. **https://www.york.ac.uk/media/economics/documents/hedg/workingpapers/1710.pdf**
8. Baker DP. 2014. *The Schooled Society: The Educational Transformation of Global Culture*. Stanford, CA: Stanford Univ. Press
9. Baker DP, Smith WC, Muñoz IG, Jeon H, Fu T, et al. 2017. The population education transition curve: education gradients across population exposure to new health risks. *Demography* 54:1873–95
10. Bauldry S. 2014. Conditional health-related benefits of higher education: an assessment of compensatory versus accumulative mechanisms. *Soc. Sci. Med.* 111:94–100
11. Baum A, Garofalo JP, Yali AM. 1999. Socioeconomic status and chronic stress: Does stress account for SES effects on health? *Ann. N. Y. Acad. Sci.* 896:131–44
12. Becker GS. 1964. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. Chicago: Univ. Chicago Press
13. Behrman J, Kohler H-P, Jensen VM, Pedersen D, Petersen I, et al. 2011. Does more schooling reduce hospitalization and delay mortality? New evidence based on Danish twins. *Demography* 48:1347–75
14. Behrman JR, Xiong Y, Zhang J. 2015. Cross-sectional schooling-health associations misrepresented causal schooling effects on adult health and health-related behaviors: evidence from the Chinese Adults Twins Survey. *Soc. Sci. Med.* 127:190–97
15. Boardman JD, Fletcher JM. 2014. To cause or not to cause? That is the question, but identical twins might not have all of the answers. *Soc. Sci. Med.* 127:198–200
16. Böckerman P, Maczulskij T. 2016. The education-health nexus: fact and fiction. *Soc. Sci. Med.* 150:112–16
17. Bor J, Cohen GH, Galea S. 2017. Population health in an era of rising income inequality: USA, 1980–2015. *Lancet* 389:1475–90
18. Bourdieu P, Passeron J-C. 1990. *Reproduction in Education, Society and Culture*, transl. R Nice. Newbury Park, CA: Sage. (From French)
19. Brand JE, Xie Y. 2010. Who benefits most from college? Evidence for negative selection in heterogeneous economic returns to higher education. *Am. Sociol. Rev.* 75:273–302
20. Breen R, Jonsson JO. 2005. Inequality of opportunity in comparative perspective: recent research on educational attainment and social mobility. *Annu. Rev. Sociol.* 31:223–43
21. Buchmann C, DiPrete TA, McDaniel A. 2008. Gender inequalities in education. *Annu. Rev. Sociol.* 34:319–37
22. Bur. Labor Stat. 2017. *College enrollment and work activity of 2016 high school graduates*. News Release, April 27, Bur. Labor Stat., Washington, DC. **https://www.bls.gov/news.release/pdf/hsgec.pdf**
23. Cahalan M, Perna L, Yamashita M. 2016. *Indicators of Higher Education Equity in the United States: 2016 Historical Trend Report*. Washington, DC/Philadelphia, PA: Pell Inst./Penn Alliance for High. Educ. Democr. (AHEAD)

24. Calarco JM. 2014. Coached for the classroom: parents' cultural transmission and children's reproduction of educational inequalities. *Am. Sociol. Rev.* 79:1015–37
25. Campbell F, Conti G, Heckman JJ, Moon SH, Pinto R, et al. 2014. Early childhood investments substantially boost adult health. *Science* 343:1478–85
26. Card D, Lemieux T. 1996. Wage dispersion, returns to skill, and black-white wage differentials. *J. Econ.* 74:319–61
27. Carnevale AP. 2008. College for all? *Change* 40:22–31
28. Case A, Deaton A. 2015. Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century. *PNAS* 112:15078–83
29. Case A, Deaton A. 2017. Mortality and morbidity in the 21st century. *Brookings Pap. Econ. Act.* March 23. **https://www.brookings.edu/bpea-articles/mortality-and-morbidity-in-the-21st-century/**
30. Cataldi EF, Green C, Henke R, Lew T, Woo J, et al. 2011. *2008–09 Baccalaureate and Beyond Longitudinal Study (B&B:08/09): First Look (NCES 2011–236)*, ed. US Dep. Educ. Washington, DC: Natl. Cent. Educ. Stat. **https://nces.ed.gov/pubs2011/2011236.pdf**
31. Christenson BA, Johnson NE. 1995. Educational inequality in adult mortality: an assessment with death certificate data from Michigan. *Demography* 32:215–29
32. Clark D, Royer H. 2013. The effect of education on adult mortality and health: evidence from Britain. *Am. Econ. Rev.* 103:2087–120
33. Coburn D. 2000. Income inequality, social cohesion and the health status of populations: the role of neo-liberalism. *Soc. Sci. Med.* 51:135–46
34. Collins R. 1979. *The Credential Society: An Historical Sociology of Education and Stratification*. New York: Academic
35. Crimmins E, Kim J, Vasunilashorn S. 2010. Biodemography: new approaches to understanding trends and differences in population health and mortality. *Demography* 47:S41–64
36. Cutler DM, Lleras-Muney A. 2008. Education and health: evaluating theories and evidence. In *Making Americans Healthier: Social and Economic Policy as Health Policy*, ed. RF Schoeni, JS House, GA Kaplan, H Pollack, pp. 29–60. New York: Russell Sage Found.
37. Cutler DM, Lleras-Muney A. 2010. Understanding differences in health behaviors by education. *J. Health Econ.* 29:1–28
38. Dowd JB, Hamoudi A. 2014. Is life expectancy really falling for groups of low socio-economic status? Lagged selection bias and artefactual trends in mortality. *Int. J. Epidemiol.* 43:983–88
39. Duke N, Macmillan R. 2016. Schooling, skills, and self-rated health: a test of conventional wisdom on the relationship between educational attainment and health. *Sociol. Educ.* 89:171–206
40. Eide ER, Showalter MH. 2011. Estimating the relation between health and education: What do we know and what do we need to know? *Econ. Educ. Rev.* 30:778–91
41. Eikemo TA, Huisman M, Bambra C, Kunst AE. 2008. Health inequalities according to educational level in different welfare regimes: a comparison of 23 European countries. *Sociol. Health Illn.* 30:565–82
42. Elo IT, Preston SH. 1996. Educational differentials in mortality: United States, 1979–85. *Soc. Sci. Med.* 42:47–57
43. Evans GW, Kantrowitz E. 2002. Socioeconomic status and health: the potential role of environmental risk exposure. *Annu. Rev. Public Health* 23:303–31
44. Ezzati M, Friedman AB, Kulkarni SC, Murray CJ. 2008. The reversal of fortunes: trends in county mortality and cross-county mortality disparities in the United States. *PLOS Med.* 5:e66
45. Feinstein L, Sabates R, Anderson TM, Sorhaindo A, Hammond C. 2006. What are the effects of education on health? In *Measuring the Effects of Education on Health and Civic Engagement: Proceedings of the Copenhagen Symposium*, pp. 171–354. Paris: OECD
46. Feldman JJ, Makuc DM, Kleinman JC, Cornoni-Huntley J. 1989. National trends in educational differentials in mortality. *Am. J. Epidemiol.* 129:919–33
47. Fletcher JM. 2015. New evidence of the effects of education on health in the US: compulsory schooling laws revisited. *Soc. Sci. Med.* 127:101–7
48. Freese J, Lutfey K. 2011. Fundamental causality: challenges of an animating concept for medical sociology. In *Handbook of the Sociology of Health, Illness, and Healing: A Blueprint for the 21st Century*, ed. BA Pescosolido, JK Martin, JD McLeod, A Rogers, pp. 67–81. New York: Springer

49. Fujiwara T, Kawachi I. 2009. Is education causally related to better health? A twin fixed-effect study in the USA. *Int. J. Epidemiol.* 38:1310–22
50. George LK. 2003. Life course research. In *Handbook of the Life Course*, ed. JT Mortimer, JM Shanahan, pp. 671–80. New York: Springer Sci.+Bus. Media
51. Gerdtham U-G, Lundborg P, Lyttkens CH, Nystedt P. 2016. Do education and income really explain inequalities in health? Applying a twin design. *Scand. J. Econ.* 118:25–48
52. Gerth H, Mills CW, eds. 1946. *From Max Weber: Essays in Sociology*. New York: Oxford Univ. Press
53. Goesling B. 2007. The rising importance of education for health? *Soc. Forces* 85:1621–44
54. Grodsky E, Jackson E. 2009. Social stratification in higher education. *Teach. Coll. Rec.* 111:2347–84
55. Halpern-Manners A, Schnabel L, Hernandez EM, Silberg JL, Eaves LJ. 2016. The relationship between education and mental health: new evidence from a discordant twin study. *Soc. Forces* 95:107–31
56. Hayward MD, Hummer RA, Sasson I. 2015. Trends and group differences in the association between educational attainment and US adult mortality: implications for understanding education's causal influence. *Soc. Sci. Med.* 127:8–18
57. Heckman JJ. 2006. Skill formation and the economics of investing in disadvantaged children. *Science* 312:1900–2
58. Hendi AS. 2015. Trends in U.S. life expectancy gradients: the role of changing educational composition. *Int. J. Epidemiol.* 44:946–55
59. Hessel P, Thomas JS. 2016. Invited commentary to: Lynch and von Hippel "An education gradient in health, a health gradient in education, or a confounded gradient in both?" *Soc. Sci. Med.* 158:168–70
60. Hill TD, Needham BL. 2006. Gender-specific trends in educational attainment and self-rated health, 1972–2002. *Am. J. Public Health* 96:1288–92
61. Hoffmann R. 2008. *Socioeconomic Differences in Old Age Mortality*. Dordrecht, Neth.: Springer Sci.+Bus. Media
62. Holmes CJ, Zajacova A. 2014. Education as "the great equalizer": health benefits for black and white adults. *Soc. Sci. Q.* 95:1064–85
63. Houle JN. 2013. Disparities in debt: parents' socioeconomic resources and young adult student loan debt. *Sociol. Educ.* 87:53–69
64. Houle JN, Warner C. 2017. Into the red and back to the nest? Student debt, college completion, and returning to the parental home among young adults. *Sociol. Educ.* 90:89–108
65. Hout M. 2012. Social and economic returns to college education in the United States. *Annu. Rev. Sociol.* 38:379–400
66. Hummer RA, Lariscy JT. 2011. Educational attainment and adult mortality. In *International Handbook of Adult Mortality*, ed. RG Rogers, EM Crimmins, pp. 241–61. New York: Springer
67. Jemal A, Ward E, Hao Y, Thun MJ. 2005. Trends in the leading causes of death in the United States, 1970–2002. *JAMA* 294:1255–59
68. Johnson-Lawrence V, Zajacova A, Sneed R. 2017. Education, race/ethnicity, and multimorbidity among adults aged 30–64 in the National Health Interview Survey. *SSM—Popul. Health* 3:366–72
69. Kao G, Thompson JS. 2003. Racial and ethnic stratification in educational achievement and attainment. *Annu. Rev. Sociol.* 29:417–42
70. Kirkpatrick Johnson M, Staff J, Schulenberg JE, Patrick ME. 2016. Living healthier and longer: a life course perspective on education and health. In *Handbook of the Life Course*, ed. MJ Shanahan, JT Mortimer, M Kirkpatrick Johnson, pp. 369–88. Cham, Switz.: Springer Int.
71. Kitagawa EM, Hauser PM. 1973. *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology*. Cambridge, MA: Harvard Univ. Press
72. Krieger N, Rehkopf DH, Chen JT, Waterman PD, Marcelli E, Kennedy M. 2008. The fall and rise of US inequities in premature mortality: 1960–2002. *PLOS Med.* 5:e46
73. Lawrence EM. 2017. Why do college graduates behave more healthfully than those who are less educated? *J. Health Soc. Behav.* 58:291–306
74. Lawrence EM, Rogers RG, Zajacova A. 2016. Educational attainment and mortality in the United States: effects of degrees, years of schooling, and certification. *Popul. Res. Policy Rev.* 35:501–25
75. Link BG, Phelan J. 1995. Social conditions as fundamental causes of disease. *J. Health Soc. Behav.* 35:80–94

76. Link BG, Phelan JC. 2006. Stigma and its public health implications. *Lancet* 367:528–29
77. Liu H, Hummer RA. 2008. Are educational differences in U.S. self-rated health increasing?: An examination by gender and race. *Soc. Sci. Med.* 67:1898–906
78. Lleras-Muney A. 2005. The relationship between education and adult mortality in the United States. *Rev. Econ. Stud.* 72:189–221
79. Lundborg P. 2013. The health returns to schooling—what can we learn from twins? *J. Popul. Econ.* 26:673–701
80. Lundborg P, Lyttkens CH, Nystedt P. 2016. The effect of schooling on mortality: new evidence from 50,000 Swedish twins. *Demography* 53:1135–68
81. Lynch JL, von Hippel PT. 2016. An education gradient in health, a health gradient in education, or a confounded gradient in both? *Soc. Sci. Med.* 154:18–27
82. Mackenbach JP, Stirbu I, Roskam A-JR, Schaap MM, Menvielle G, et al. 2008. Socioeconomic inequalities in health in 22 European countries. *N. Engl. J. Med.* 358:2468–81
83. Madsen M, Andersen PK, Gerster M, Andersen A-MN, Christensen K, Osler M. 2014. Are the educational differences in incidence of cardiovascular disease explained by underlying familial factors? A twin study. *Soc. Sci. Med.* 118:182–90
84. Marmot MG, Bell R. 2009. Action on health disparities in the United States: Commission on Social Determinants of Health. *JAMA* 301:1169–71
85. Martin LG, Schoeni RF, Andreski PM. 2010. Trends in health of older adults in the United States: past, present, future. *Demography* 47:S17–40
86. Masters RK, Hummer RA, Powers DA. 2012. Educational differences in U.S. adult mortality: a cohort perspective. *Am. Sociol. Rev.* 77:548–72
87. Mayhew MJ, Rockenbach AN, Bowman NA, Seifert TA, Wolniak GC, et al. 2016. *How College Affects Students*. Volume 3: *21st Century Evidence That Higher Education Works*. San Francisco, CA: Jossey-Bass
88. Mazumder B. 2008. Does education improve health? A reexamination of the evidence from compulsory schooling laws. *Econ. Perspect.* 32:2–16
89. Mazumder B. 2012. The effects of education on health and mortality. *Nord. Econ. Policy Rev.* 2012:264–309
90. McDade TW, Hawkley LC, Cacioppo JT. 2006. Psychosocial and behavioral predictors of inflammation in middle-aged and older adults: the Chicago health, aging, and social relations study. *Psychosom. Med.* 68:376–81
91. McDonough P, Williams DR, House JS, Duncan GJ. 1999. Gender and the socioeconomic gradient in mortality. *J. Health Soc. Behav.* 40:17–31
92. Meara ER, Richards S, Cutler DM. 2008. The gap gets bigger: changes in mortality and life expectancy, by education, 1981–2000. *Health Aff.* 27:350–60
93. Mirowsky J, Ross CE. 2003. *Education, Social Status, and Health*. New York: Aldine de Gruyter
94. Mirowsky J, Ross CE. 2008. Education and self-rated health: cumulative advantage and its rising importance. *Res. Aging* 30:93–122
95. Monnat S. 2016. *Deaths of despair and support for Trump in the 2016 presidential election*. Res. Brief, Dec. 4, Pa. State Univ. Dep. Agric. Econ., Soc. Educ., State College, PA. **http://aese.psu.edu/directory/smm67/Election16.pdf**
96. Montez JK. 2017. Deregulation, devolution, and state preemption laws' impact on US mortality trends. *Am. J. Public Health* 107:1749–50
97. Montez JK. 2017. *Do U.S. states' socioeconomic and political contexts shape adult disability?* Presented at NIA-Supported Network on Life Course Health Dynamics and Disparities in 21st Century America, Chicago
98. Montez JK, Hummer RA, Hayward MD. 2012. Educational attainment and adult mortality in the United States: a systematic analysis of functional form. *Demography* 49:315–36
99. Montez JK, Zajacova A. 2013. Trends in mortality risk by education level and cause of death among US white women from 1986 to 2006. *Am. J. Public Health* 103:473–79
100. Montez JK, Zajacova A, Hayward MD. 2016. Explaining inequalities in women's mortality between US states. *SSM—Popul. Health* 2:561–71
101. Montez JK, Zajacova A, Hayward MD. 2017. Disparities in disability by educational attainment across US states. *Am. J. Public Health* 107:1101–8

102. Muennig P. 2015. Can universal pre-kindergarten programs improve population health and longevity? Mechanisms, evidence, and policy implications. *Soc. Sci. Med.* 127:116–23
103. Nash R. 1990. Bourdieu on education and social and cultural reproduction. *Br. J. Sociol. Educ.* 11:431–47
104. Navarro V, Shi L. 2001. The political context of social inequalities and health. *Soc. Sci. Med.* 52:481–91
105. Pampel FC, Krueger PM, Denney JT. 2010. Socioeconomic disparities in health behaviors. *Annu. Rev. Sociol.* 36:349–70
106. Piketty T. 2014. *Capital in the Twenty-First Century*. Cambridge, MA: Harvard Univ. Press
107. Psacharopoulos G, Patrinos HA. 2004. Returns to investment in education: a further update. *Educ. Econ.* 12:111–34
108. Quiñones AR, Markwardt S, Botoseneanu A. 2016. Multimorbidity combinations and disability in older adults. *J. Gerontol. Ser. A: Biol. Sci. Med. Sci.* 71:823–30
109. Rogot E, Sorlie PD, Johnson NJ. 1992. Life expectancy by employment status, income, and education in the National Longitudinal Mortality Study. *Public Health Rep*. 107:457–61
110. Rosenbaum J. 2012. Degrees of health disparities: health status disparities between young adults with high school diplomas, sub-baccalaureate degrees, and baccalaureate degrees. *Health Serv. Outcomes Res. Methodol.* 12:156–68
111. Ross C, Masters R, Hummer RA. 2012. Education and the gender gaps in health and mortality. *Demography* 49:1157–83
112. Ross CE, Wu C-L. 1995. The links between education and health. *Am. Sociol. Rev.* 60:719–45
113. Ryan CL, Bauman K. 2016. *Educational attainment in the United States: 2015*. March, Rep. P20-578, US Census Bur., Washington, DC. **https://www.census.gov/content/dam/Census/library/publications/2016/demo/p20-578.pdf**
114. Saha LJ. 2008. Sociology of education. In *21st Century Education: A Reference Handbook*, ed. TL Good, pp. 299–307. Thousand Oaks, CA: Sage
115. Sasson I. 2016. Diverging trends in cause-specific mortality and life years lost by educational attainment: evidence from United States Vital Statistics Data, 1990–2010. *PLOS ONE* 11:e0163412
116. Sasson I. 2016. Trends in life expectancy and lifespan variation by educational attainment: United States, 1990–2010. *Demography* 53:269–93
117. Schoenborn CA, Adams PF, Peregoy JA. 2013. *Health Behaviors of Adults: United States, 2008–2010*. Vital Health Stat. Ser. 10. Atlanta: US Dep Health Hum. Serv., CDC, Natl. Cent. Health Stat. **https://www.cdc.gov/nchs/data/series/sr_10/sr10_257.pdf**
118. Schoeni RF, Freedman VA, Wallace RB. 2001. Persistent, consistent, widespread, and robust? Another look at recent trends in old-age disability. *J. Gerontol. Ser. B: Psychol. Sci. Soc. Sci.* 56:S206–18
119. Schoeni RF, Martin LG, Andreski PM, Freedman VA. 2005. Persistent and growing socioeconomic disparities in disability among the elderly: 1982–2002. *Am. J. Public Health* 95:2065–70
120. Sewell WH, Haller AO, Portes A. 1969. The educational and early occupational attainment process. *Am. Sociol. Rev.* 34:82–92
121. Shiels MS, Chernyavskiy P, Anderson WF, Best AF, Haozous EA, et al. 2017. Diverging trends in premature mortality in the U.S. by sex, race, and ethnicity in the 21st century. *Lancet* 389:1043–54
122. Silles MA. 2009. The causal effect of education on health: evidence from the United Kingdom. *Econ. Educ. Rev.* 28:122–28
123. Skalamera J, Hummer RA. 2016. Educational attainment and the clustering of health-related behavior among U.S. young adults. *Prev. Med.* 84:83–89
124. Sorlie PD, Backlund E, Keller JB. 1995. US mortality by economic, demographic, and social characteristics: the National Longitudinal Mortality Study. *Am. J. Public Health* 85:949–56
125. Spence M. 1973. Job market signalling. *Q. J. Econ.* 87:355–79
126. Stevens ML, Armstrong EA, Arum R. 2008. Sieve, incubator, temple, hub: empirical and theoretical advances in the sociology of higher education. *Annu. Rev. Sociol.* 34:127–51
127. Stuber JM. 2011. *Inside the College Gates: How Class and Culture Matter in Higher Education*. Lanham, MD: Lexington Books
128. Taylor SE, Seeman TE. 1999. Psychosocial resources and the SES-health relationship. *Ann. N. Y. Acad. Sci.* 896:210–25

129. Temin P. 2017. *The Vanishing Middle Class: Prejudice and Power in a Dual Economy*. Cambridge, MA: MIT Press
130. Tsai Y. 2016. Education and disability trends of older Americans, 2000–2014. *J. Public Health* 39:447–54
131. Waite LJ, Gallagher M. 2002. *The Case for Marriage: Why Married People Are Happier, Healthier and Better Off Financially*. New York: Random House
132. Walsemann KM, Gee GC, Ro A. 2013. Educational attainment in the context of social inequality: new directions for research on education and health. *Am. Behav. Sci.* 57:1082–104
133. Williams DR. 1990. Socioeconomic differentials in health: a review and redirection. *Soc. Psychol. Q.* 53:81–99
134. Williams DR, Collins C. 1995. US socioeconomic and racial differences in health: patterns and explanations. *Annu. Rev. Sociol.* 21:349–86
135. Williams DR, Jackson PB. 2005. Social sources of racial disparities in health. *Health Aff.* 24:325–34
136. Willis PE. 1977. *Learning to Labor: How Working Class Kids Get Working Class Jobs*. New York: Columbia Univ. Press
137. Woolf SH, Aron LY. 2013. The US health disadvantage relative to other high-income countries: findings from a National Research Council/Institute of Medicine report. *JAMA* 309:771–72
138. Yoshikawa H, Weiland C, Brooks-Gunn J. 2016. When does preschool matter? *Future Child.* 26:21–35
139. Zajacova A. 2006. Education, gender, and mortality: Does schooling have the same effect on mortality for men and women in the US? *Soc. Sci. Med.* 63:2176–90
140. Zajacova A, Dowd JB, Aiello AE. 2009. Socioeconomic and race/ethnic patterns in persistent infection burden among U.S. adults. *J. Gerontol. A: Biol. Sci. Med. Sci.* 64:272–79
141. Zajacova A, Hummer RA, Rogers RG. 2012. Education and health among U.S. working-age adults: a detailed portrait across the full educational-attainment spectrum. *Biodemogr. Soc. Biol.* 58:40–61
142. Zajacova A, Johnson-Lawrence V. 2016. Anomaly in the education–health gradient: biomarker profiles among adults with subbaccalaureate attainment levels. *SSM—Popul. Health* 2:360–64
143. Zajacova A, Montez JK. 2017. Physical functioning trends among US women and men age 45–64 by education level. *Biodemogr. Soc. Biol.* 63:21–30
144. Zajacova A, Rogers RG, Johnson-Lawrence V. 2012. Glitch in the gradient: Additional education does not uniformly equal better health. *Soc. Sci. Med.* 75:2007–12