

Education: A Missed Opportunity for Public Health Intervention

Alison Klebanoff Cohen, MPH, and S. Leonard Syme, PhD

Educational attainment is a well-established social determinant of health. It affects health through many mechanisms such as neural development, biological aging, health literacy and health behaviors, sense of control and empowerment, and life chances. Education—from preschool to beyond college—is also one of the social determinants of health for which there are clear policy pathways for intervention. We reviewed evidence from studies of early childhood, kindergarten through 12th grade, and higher education to identify which components of educational policies and programs are essential for good health outcomes. We have discussed implications for public health interventions and health equity. (*Am J Public Health*. 2013;103:997–1001. doi: 10.2105/AJPH.2012.300993)

Social class is a fundamental determinant of health and disease¹ and is associated with the persistence of health inequalities.^{2,3} One of several components that determine social class standing, education contributes to cumulative advantage⁴ across the life course⁵ and is strongly associated with both morbidity^{6–10} and mortality.^{11–14} Formal education—from preschool to beyond college—is also one of the social determinants of health for which there are clear policy pathways for intervention.^{12,15,16}

Uncertainty exists, however, about the specific elements of education that influence health. Is it teacher training, classroom interactions, selective institutions, or something else? To recommend particular types of educational interventions, we must better understand the elements of the education experience that are associated with health and, in particular, whether this association is causal.^{17,18} The body of educational research on successful educational interventions is still growing. For example, in addition to imparting knowledge, educational institutions may perpetuate societal power structures that help set social norms,¹⁹ a phenomenon already identified as important for health.³ Education may also affect health^{6–10} via neural development,²⁰ biological aging,^{12,15,16} health literacy and health behaviors,^{6,17,18,21–23} sense of control and empowerment,²⁴ and life chances (e.g., income and occupation).^{6,17} Figure 1 illustrates these potential pathways. Each of

these mechanisms may have implications that differ for individual health versus population health.

Is the amount of education the most important element in the equation? It certainly is the easiest to measure.¹⁰ Or is it the quality of education? Or the type of people who seek education? Is it the knowledge imparted? The historical context of the study population matters as well. For example, years of education attained is typically used as a measure of the baseline predictor of neurocognitive status. However, recent studies of older African Americans found that reading level was actually a better predictor of baseline neurocognitive status than were years of schooling²⁵ and that accounting for reading level could perhaps reduce observed racial disparities in cognitive test scores.²⁶ To understand the potential implications of this finding, we must contextualize the study population in the history of education policy. The age of these study participants indicates they attended school pre-*Brown v. Board of Education* (e.g., in the 1930s and 1940s), and because they were African American, they likely attended segregated schools that were typically of lower quality.²⁷ Reading below grade level is associated with and reflective of having attended a lower quality school.^{28,29} Additionally, increasing one's reading level can lead to accumulating other educational advantages; such cumulative advantages can accentuate disparities.⁴ As a result, one's reading level may

improve neurocognitive health and mitigate health disparities.

As illustrated by this example, answering these questions requires a study of 2 bodies of literature that are not often considered together but that share common goals and values.³⁰ We critically reviewed the education literature and the public health literature to summarize what researchers in these fields know and to identify future needed research directions.

EARLY CHILDHOOD EDUCATION

Scholars in fields as diverse as economics and neurobiology have identified early childhood as a critical time in human development.³¹ Furthermore, education, public health, and economics researchers have deemed early childhood education to be important and effective in policy interventions.³² But scholars mean many different things when they discuss early childhood education. Early childhood education includes programs such as Perry Preschool, which was an intensive program that involved parents and served Ypsilanti, Michigan, a particularly underserved community^{33–37}; Head Start, a federal program implemented locally that provides preschool education and health services^{31,38,39}; and daycare programs, some of which primarily serve to supervise children so caregivers can work outside the home.^{32,40} Sometimes the only thing early childhood education programs share is the age of the participants, although even age can range in a developmentally meaningful way, from infants to prekindergartners.^{27,40} There are often differences between an envisioned gold standard that is studied and what a program looks like when it has been scaled up or suffered funding cuts, such as when results from the Perry Preschool program were used to make the case for the nationwide Head Start program.³²

Of all the early education programs that have been studied in recent years, only

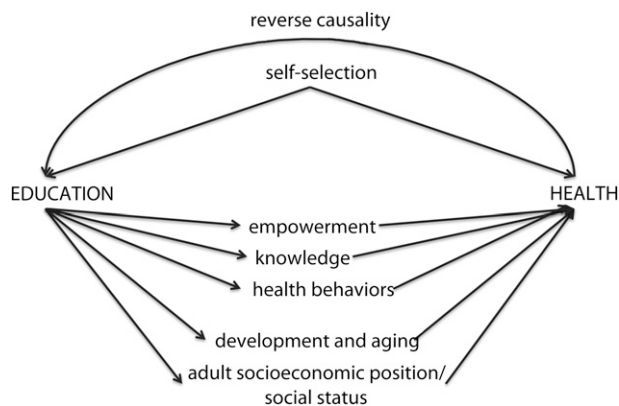


FIGURE 1—Potential pathways through which education may affect health.

high-quality programs appear to have a strong impact,^{27,41,42} as illustrated by different evaluations of the Head Start program. Because this program has been implemented differently in different states, the quality and results observed in the programs have varied widely.^{43,44} Nevertheless, Head Start appears to have had an overall favorable impact on health outcomes^{6,8–10,45} that is almost as large as that seen in the original Perry Preschool program.^{39,46,47} Participants in other model early childhood programs, such as the Carolina Abecedarian Project, also have achieved better health outcomes and better health behaviors in adulthood than have those randomized to a control group,^{43,48} and a quasiexperimental study of the Chicago, Illinois, Child–Parent Centers observed similar benefits to educational, economic, and health outcomes in adulthood.⁴⁹

High-quality early childhood programs may have different effects depending on what they emphasize; for example, an Oklahoma study found that both Head Start and universal prekindergarten are beneficial but that Head Start has greater effects on health outcomes, whereas prekindergarten has greater effects on literacy.^{50–52} However, the consensus in the literature is that early childhood education is beneficial and cost-effective for child development and educational, health, and adult economic outcomes.^{38,53}

Reviews of diverse early childhood education programs have identified the following markers of high quality: small classes, well-trained teachers with collegial support and good wages, substantial investment in the child

(either through concentrated intervention or over a long period), school–family partnerships (which sometimes involve parent fees), and the introduction of methods and content similar to what children will experience in elementary school.^{33,35–37,54} Although benefits exist for all children, reviews agree that it makes sense to target underresourced children because they have the most to benefit from such programs.^{31,38,55,56} Targeting all children, however, is useful because universal programs often receive greater political support.^{32,57–60}

KINDERGARTEN THROUGH 12TH GRADE EDUCATION

Educational interventions can take place at the school, district, or state level. We selectively reviewed recent studies that allowed us to make causal inferences about the impact of educational policies on health outcomes. Among the most transformative educational policies in the past century in the United States is desegregation. Desegregation was associated with improved school quality for non-White students, and this improved school quality was in turn associated with self-rated health,^{27,61–64} a measure of health that has been shown to be important in the prediction of future health outcomes.^{11–14,65,66} For White students, no change in school quality or health outcomes was observed.²⁷

State mandatory schooling policies raise the dropout age.⁴³ This keeps students in school longer and increases their educational attainment; their earnings in adulthood and their

children’s educational attainment are also increased.^{46,47} An instrumental variable analysis found that policies that increased the legal dropout age were associated with improved memory outcomes among White non-Hispanic older adults.⁴³

Other state and district policies affect class size. The evidence for the educational and economic effects of small class size has been summarized elsewhere.^{50,52} In elementary school, class size appears to make a difference. The Tennessee Student–Teacher Achievement Ratio study randomized elementary school students into different class sizes and provided persuasive evidence of the benefits of small class size policies, including positive cognitive and academic outcomes; the small class sizes were associated with both increased early mortality⁵³ and increased quality-adjusted life years.⁵⁴ These conflicting findings merit further investigation, including continued follow-up of the participants across the life course. However, now that these small class size policies have been implemented more widely, the change in class size has sometimes been accompanied by lower educational quality,^{55,56} which may also further adverse health impacts.

Other school-level policies and programs that have been introduced have a mixed and evolving research base. These include curricula and programming to promote positive school climate and school-level stated commitments to social and emotional development.^{57–60} The educational and health evidence bases for school facility quality and the school environment^{61–64} and school-based health centers^{12,15,67} are growing and suggest positive impacts; it is important to examine results from this research as it is made available. The results of school lunch policies are more mixed: participation in free or reduced price lunch may increase children’s risk of obesity,⁶⁸ but enrollment in free or reduced price lunch appears to increase when enticing, healthier options are made available.⁶⁹

Preventing dropping out of high school is of interest to many education leaders because dropping out affects future educational and employment trajectories; dropping out of high school is also relevant to health outcomes. The general equivalency diploma (GED) is offered as an equivalency to a high school

degree for those who dropped out, yet the health^{17,18,70} and labor^{19,71} benefits associated with having a GED are less than are the benefits associated with being a high school graduate (although GED recipients do have better outcomes than do high school dropouts without a GED).

In other domains, the link to health outcomes has been hypothesized but not yet observed empirically. For example, parental engagement in elementary school^{3,72} and high school^{7,73} is associated with student academic achievement, and parental engagement at home has implications for other health outcomes.^{20,74} These findings suggest that parental engagement in school is also relevant for education as a social determinant of health, but we found no systematic evidence to support this expectation.

HIGHER EDUCATION

The relationship between educational attainment and health may be nonlinear.^{16,18,75} This may be because of a “sheepskin effect”: health outcomes may be attributable to the degree (or credential) attained, rather than the years of education.^{6,17,18,21–23,76} Few researchers have considered the potentially unique health patterns of those who attended some college but did not graduate compared with high school graduates and college graduates, but these individuals are an important and growing subpopulation who merit further attention.

Among the relevant degrees, a bachelor’s degree in particular is associated with a wide variety of health benefits. This may be because college graduation commonly contributes to social and economic stratification.^{24,77} One decision analysis model calculated that college tuition subsidies would lead to increased enrollment in college, which would in turn increase quality-adjusted life expectancy.^{6,17,78} However, as more people attend college, the quality of the college, as indicated by prestige and reputation, becomes an increasingly important source of differentiation and stratification.^{10,79} College prestige and reputation can be affected by the same inputs, such as class size and well-trained teachers, that were important in kindergarten through 12th grade educational quality, but the focus is on prestige—which additional factors, such as

alumni social status, also determine—rather than on the inputs.

As the US population becomes increasingly college educated, there are 2 ways that the association of being a college graduate with health is potentially affected. First, increasing college attendance could improve population health. Second, a new elite stratum (e.g., individuals who attend highly selective colleges or graduate schools) may arise with the best health outcomes, thereby increasing health inequities. Noting how these trends develop over time will help us better understand exactly how college graduation may improve health outcomes.

CONCLUSIONS

As early as 1848, Horace Mann identified education as “the balance wheel of the social machinery.”⁸⁰ The school continues to be a particularly opportune site for intervention to overcome the social class inequities that in turn drive health inequities. Identifying what is most effective about education is essential for targeting local, state, and federal policy interventions accordingly.

We encourage public health researchers to apply cost–benefit analyses and health impact assessments to educational policies and programs such as those related to length of school year and school day, the choice between busing versus neighborhood schools, and full-service community schools. We recommend that these cost–benefit analyses and health impact assessments study benefits to health accrued over the life course, which will require further longitudinal research to identify what benefits (or costs) occur decades after the original interventions.

A few well-executed randomized controlled trials, including the Perry Preschool and the Tennessee Student–Teacher Achievement Ratio studies, have been particularly persuasive to education policymakers. Similarly, a small body of randomized controlled trials considering the relationship between education and health has been influential despite mixed findings. As education systems become increasingly data driven, they are generating large quantities of observational data. We recommend applying causal inference approaches to observational data⁸¹ to help inform policy

decision making and decision making about future randomized controlled trials.

Our review suggests that benefits arise from receiving high-quality education. Educational quality is essential across an individual’s school trajectory (e.g., early childhood through higher education). When quality varies, fade-out effects are commonly observed. Quality is defined differently in early childhood and kindergarten through 12th grade than in higher education. Often public health researchers conceptualize education solely as years of education attained starting with kindergarten; we argue that early childhood education and educational quality are critical facets of the educational experience to consider as well. We recommend that researchers identify innovative ways to measure the quality of the educational experience when assessing education as a social determinant of health. For preschool through 12th grade, it appears that quality is related to educational inputs (e.g., small classes, well-trained teachers, and partnerships with families), whereas in higher education, quality may reflect existing privilege and therefore be more intangible; nevertheless, this is important to document.

We encourage researchers to examine the health effects of educational quality across the life course. In addition to examining quality, future research on higher education and health should examine different college experiences—in particular, how those who attend some college may have different life chances and health trajectories than do high school graduates or college graduates.

In addition to assessing health effects, it is important to consider potential mechanisms of the association of education with health to better understand what types of interventions may affect specific education and health domains. We encourage more researchers to consider the probable causal pathway of education as a source of empowerment with resultant implications for health, which, to the best of our knowledge, has gone understudied.

Education allows individuals to make sense of the world around them, and understanding the world empowers individuals to make changes effectively.^{32,82} Empowerment, in turn, is associated with better health outcomes.^{83,84} We encourage researchers to evaluate the impact of education and

educational empowerment programs on empowerment and health outcomes. Education may affect health through other mechanisms as well. For example, some researchers have innovatively controlled for genetics by studying twin pairs and hypothesized that education may affect health outcomes by influencing social norms.⁸⁵

As educational and health inequities often affect the same individuals and communities,³⁰ we recommend that researchers explore not only which educational policies and programs affect health outcomes but also to what extent such interventions can address inequities. This will require understanding how educational initiatives affect specific educational outcomes—about which the research literature in education is still in its early stages—in addition to understanding how these programs may affect health. With an eye to future policy and program development, we also encourage researchers to identify pathways by which these educational interventions may lead to health outcomes. Addressing health inequities requires creatively identifying new opportunities to do so. We encourage public health researchers and practitioners to leverage programs in the educational sphere as an additional tool. ■

About the Authors

Alison Klebanoff Cohen and S. Leonard Syme are with the School of Public Health, University of California, Berkeley. Correspondence should be sent to Alison K. Cohen, Division of Epidemiology, School of Public Health, University of California, Berkeley, 101 Haviland Hall, Berkeley, CA 94720-7358 (e-mail: akcohen@berkeley.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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Contributors

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