Invited Commentary

Invited Commentary: Multigenerational Social Determinants of Health—Opportunities and Challenges

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An emerging area of social epidemiology examines the relationship between grandparental education and grandchild health. In an accompanying article, Huang et al. (Am J Epidemiol. 2015;182(7):568–578) join the small but growing body of research on this topic. It is useful to contextualize Huang et al.’s work within the much larger body of research examining relationships between education and health within a single generation or across 2 generations. These investigators have generally concluded that higher educational attainment is robustly associated with better health. There are many potential mechanisms through which education and other social exposures may affect health outcomes in a single generation or across generations, and estimating direct and indirect effects can be helpful for assessing specific mechanisms. Researchers conducting multigenerational analyses are faced with several challenges, including limited availability of data for some measures (e.g., educational attainment, and sometimes for 1 grandparent only), limited age ranges of participants, disparate social and political contexts in which study participants of different generations have lived, and patterns of social class reproduction. We encourage future researchers to weave together the careful analytical considerations illustrated by Huang et al. with a rich understanding of the social context for each of the generations studied to help overcome these challenges and advance our understanding of multigenerational social determinants of health.

birth weight; education; life course; multigenerational factors; social epidemiology; weight status

Abbreviation: AddHealth, National Longitudinal Study of Adolescent to Adult Health.

In this issue, the article by Huang et al. (1) joins 3 other American studies (2–4), 5 studies of European populations (5–9), and 1 study carried out in Hong Kong, China (10), all in recent years, that have considered how grandparental education is associated with grandchildren’s health. Huang et al. examined the relationship between grandmaternal education and grandchild’s birth weight in a US study, the National Longitudinal Study of Adolescent to Adult Health (Add Health). Using marginal structural models, they found a positive association between grandmaternal educational attainment and grandchild birth weight that was independent of the maternal characteristics for which they were able to adjust, and they concluded from a quantitative bias analysis that their results were not likely to result from an unmeasured mediator-outcome confounder (1).

It is useful to contextualize Huang et al.’s work within the larger body of literature on education and health. Researchers have concluded that the relationship between education and health is probably bidirectional, such that education affects later health outcomes but early-life health can also affect educational trajectories (11, 12). However, since Huang et al. focused on how education can affect health, we will focus primarily on this line of research. Additionally, as in the majority of such studies, Huang et al. focused specifically on the role of educational attainment (1), but it is important to note that other dimensions of the educational experience, including quality, also affect health (11).

Within a single generation, hundreds of studies have considered the relationship between educational attainment and health (13–15). Investigators have generally concluded that higher educational attainment is associated with better outcomes across a wide array of health measures. Intergenerational associations between higher parental education and
better child health have also been well documented in the life-course and social epidemiology literatures. These studies generally use parental education as a measure of childhood socioeconomic status, often in conjunction with other socioeconomic measures such as parental occupation or family income. Higher parental educational levels have been related to better birth outcomes (16, 17) (of particular relevance to Huang et al.’s proposed mechanism of maternal uterine environment (1)) but also to a host of other behavioral, clinical, and mortality outcomes throughout the offspring’s life course (18–26). The much smaller body of literature investigating grandparental education, including the study by Huang et al. (1), has examined relationships with grandchild birth weight and adult weight, adult height, health status, and morality (1–10). These studies have generally associated higher grandparental education with better grandchild health, but some researchers have reported null findings (4). The persistence of associations after accounting for parental characteristics has also varied by study. The question of the extent to which and the manner in which any effects of grandparental education are mediated by parental characteristics remains an open one, and we welcome Huang et al.’s contribution in this respect.

There are many mechanisms by which educational attainment may affect health outcomes in a single generation and in subsequent generations. Cohen and Syme (11) outlined several possible mechanisms for how education can affect health over a single life course, and many of these mechanisms also apply to subsequent generations. For example, education can affect adult socioeconomic position (27), which in turn affects the childhood socioeconomic position of the subsequent generation (28), which likely has health effects across the life course (29–31). In addition, studies of cumulative advantage suggest that childhood socioeconomic position also affects that individual’s educational attainment (32), which can then begin the cycle anew to affect a third generation. More aligned with Huang et al.’s focus on the intrauterine environment (1), educational attainment can also affect health behaviors (33), including potentially healthy behaviors related to pregnancy (34, 35). These maternal behaviors could in turn affect the educational attainment (36) and health (37) of the subsequent generation.

This issue reflects the broader ongoing challenge in studying social exposures such as education in defining what we mean by direct and indirect effects. There are myriad interconnected ways in which a grandmother’s education may influence a mother’s life experiences that are relevant to pregnancy outcomes, including environmental exposures, residential neighborhood characteristics, family composition, psychosocial pathways, and nutrition, among others. Given these complex causal pathways, it is virtually impossible to account for a limited set of mediators and then define meaningfully the causal mechanisms driving the resulting estimated direct effect. While we agree with Huang et al. that their results are consistent with hypothesized effects of grandmaternal education on birth weight via maternal intrauterine exposures (1) and would welcome future research in this vein, we would suggest caution in attributing the unmediated (“direct”) association of a social exposure with a health outcome to a specific causal mechanism.

Similarly, while Huang et al.’s finding that a single, binary mediator-outcome confounder would need to influence birth weight strongly or be very unbalanced across exposure levels to account completely for their result (1) is reassuring, it is plausible that a set of confounders, taken together, could fit this description. The multifactorial approach valued by social epidemiology (38) suggests it is unlikely that there is any strong single unmeasured confounder but rather more likely that there is a set of multiple, interrelated unmeasured confounders that could bias the findings. Complicated causal structures between exposures, confounders, and mediators—common in social epidemiology—can complicate bias analyses (39). However, this bias analysis is still a useful exercise for assuaging some concerns readers may have, and we encourage social epidemiologists and others to follow Huang et al.’s example in incorporating bias analyses, particularly when results are modest in magnitude and the goal is to draw some causal inference from them (40).

In addition to grounding the study of mechanisms within social epidemiology, it is also worth considering the exposures of interest themselves. Huang et al.’s focus on grandmaternal education is reasonable given their interest in the intrauterine environment and previous findings of a stronger influence of maternal education than paternal education on child health (41). However, this is not to say that paternal (and by extension grandpaternal) education does not also play an important role. Indeed, there is some evidence that paternal education is related to birth outcomes independently of maternal education (42–44). Paternal education may more strongly predict household socioeconomic resources than mother’s education or may affect the intrauterine environment by influencing the mother’s use of prenatal care, behaviors (such as smoking or alcohol drinking), or experiences of stress (42, 45). Besides the theoretical and analytical challenges posed by potentially overlapping but distinct multigenerational effects of education on the maternal and paternal side, there is the practical challenge that sources of multigenerational data containing information about both the paternal and maternal lineage are exceedingly rare.

Another challenge is that logistical limitations in amassing multigenerational data will often lead to analytical samples that are highly selected. As we mentioned above, there will often be data on only the paternal or maternal lineage. Depending on the sampling scheme, the age range of 1 or more of the generations is also often limited. In the Add Health data used in Huang et al.’s analysis (1), grandmothers (G0s) might have been of any age but the oldest mothers (G1s) would have been in their early thirties by the end of follow-up; G1s who subsequently had their first births at older ages would not have been included.

Persistent social stratification can also pose challenges to multigenerational social epidemiology studies specifically by limiting variability across generations. For example, in Huang et al.’s study, 96% of G1s whose mother (G0) graduated from college also graduated from college (1). Sociologists have extensively documented trends in educational mobility and the lack thereof in the United States (46, 47), and this has implications regarding possible practical positivity violations and less precise estimates for all combinations of maternal and grandmaternal educational attainment. We are
The study by Huang et al. (1) contributes to a small but growing body of literature examining associations between grandparental education and grandchild health. It also addresses some of the methodological challenges of this research. Despite these challenges, we believe this line of research shows promise in helping us not only to explain current health disparities but also to consider potential future implications of today’s educational patterns and practices. Doing this will require careful consideration of the changing social, political, and demographic landscape in which each generation lives (48). For example, in 1975, around the time many of the grandmothers in Huang et al.’s analysis may have been completing high school, 62% of US women aged 25 years or more had a high school diploma (49); by 2014, this percentage had grown to 89%. The last century has also seen major upheavals in educational opportunities but also to consider potential future implications of today’s educational patterns and practices. Doing this will require care-

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References


