

The income-health gradient

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The existence of a positive relationship between socioeconomic status and health has been well established; individuals who are better off financially tend to have better health and better health habits. However, until we more fully understand both the nature of this relationship and the mechanisms behind it, it may be difficult to devise policies that will substantially reduce disparities in health across groups. In this article, we review the existing evidence on the relationship between socioeconomic status and health.¹

Basic relationship between socioeconomic status and health

A positive gradient between various indicators of socioeconomic status and health has been found across all age groups, and for all countries in which it has been studied. This relationship has been identified for a variety of health indicators,

including mortality, morbidity, general health, health habits, and functional limitations. These health indicators have in turn been associated with a number of socioeconomic status measures, including income, wealth, occupation, and education. While these indicators of socioeconomic status are all related to one another, each has unique aspects. Some of these indicators may serve as both a cause and an outcome of health status. For example, income may drop as a result of poor health, and poor health may also result from income constraints. In contrast, education is generally established relatively early in life and is less likely to be subject to changes in health status. But income is easier to change in the shorter run, and so may be the favored policy instrument.

The shape of the income-health relationship

Figure 1 illustrates the basic shape of the relationship between income and health when compared across individuals or countries. While higher income is associated with better health at all points on the curve, the relationship is steepest at the bottom of the income distribution. Thus, the relative gain in health associated with, for example, a \$100 increase in income for those with low incomes ($H_a^* - H_a$) is much greater than the health gain associated with the same increase for those with high incomes ($H_b^* - H_b$).

Descriptive evidence

The strength of the socioeconomic status-health gradient varies at different ages; health gaps are greatest in mid- to late adulthood, when rates of disease begin to rise and more variation is linked to socioeconomic factors. The gap nar-

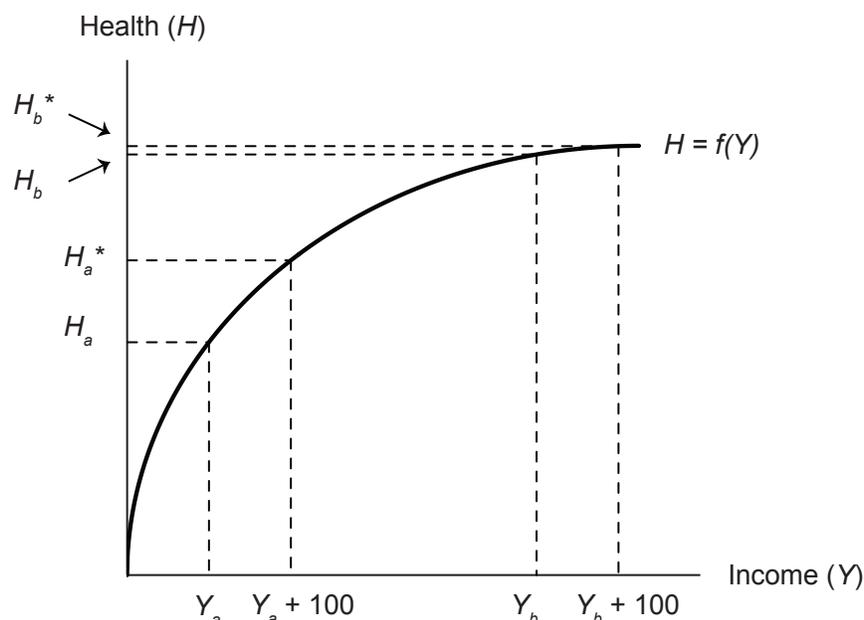


Figure 1. The income-health relationship.

rows after age 65, perhaps due to differential survival and safety net programs (such as Medicare and Social Security) that begin at that age.

Marginal effects on children’s health

The childhood period is important to examine for two reasons. First, as is described in more detail below, the childhood gradient is less susceptible to concerns of reverse causation as it is less likely that poor health is “causing” low income. Second, although the magnitude of socioeconomic status differences is greater in adulthood, previous work has demonstrated that the adult gradient has its roots in childhood.²

Our research shows that parental income is significantly related to the probability that children will experience five out of seven health outcomes that we examined.³ These seven outcomes are whether the child has fair or poor health as reported by an adult in the house; has missed 10 or more days of school in the past year due to injury or illness; has a physical, mental, or emotional condition that limits activity; had a hospital stay in the previous 12 months; had an emergency room visit in the previous 12 months; had an injury or poisoning in the past year; and has ever been diagnosed with asthma. No association is found with injuries or poisonings in the previous year or for a diagnosis of asthma. The gradient is rather steep for most outcomes. For example, as shown in Figure 2, while only 2.3 percent of children are reported by an adult in the house to be in fair or poor health, a child from a family with under \$10,000 in family income has an 8

percentage point higher probability of this status compared to a child in the highest income group.

There are two particularly notable findings in this set of results. First, children’s health improves at each higher level of family income, even at the upper levels. Thus, children whose parents have an income of \$55,000 to \$75,000 are significantly more likely to be in fair or poor health compared to children whose family incomes exceed \$75,000. Second, the declining benefit of higher income identified in Figure 1 can be seen in these results; an additional \$10,000 at the bottom of the income distribution is linked to a greater improvement in the child’s health than is an additional income increase of \$20,000 at the top of the distribution.

Marginal effects on adults’ health

The strength of the relationship between socioeconomic status and health is similarly strong for adults.⁴ We again found that those with higher incomes had better health than those with lower incomes, for three overall measures of health (report of fair or poor health; bad mental health days in past month; and bad physical health days in past month) and five measures of health habits (current smoker; obese; overweight; no exercise in past month; and rarely eats fruits and vegetables). Marginal effects are generally quite large. For example, as shown in Figure 3, those with income under \$10,000 have a 44 percentage point higher probability of reporting fair or poor health than someone with income over \$75,000, nearly three times the sample mean.

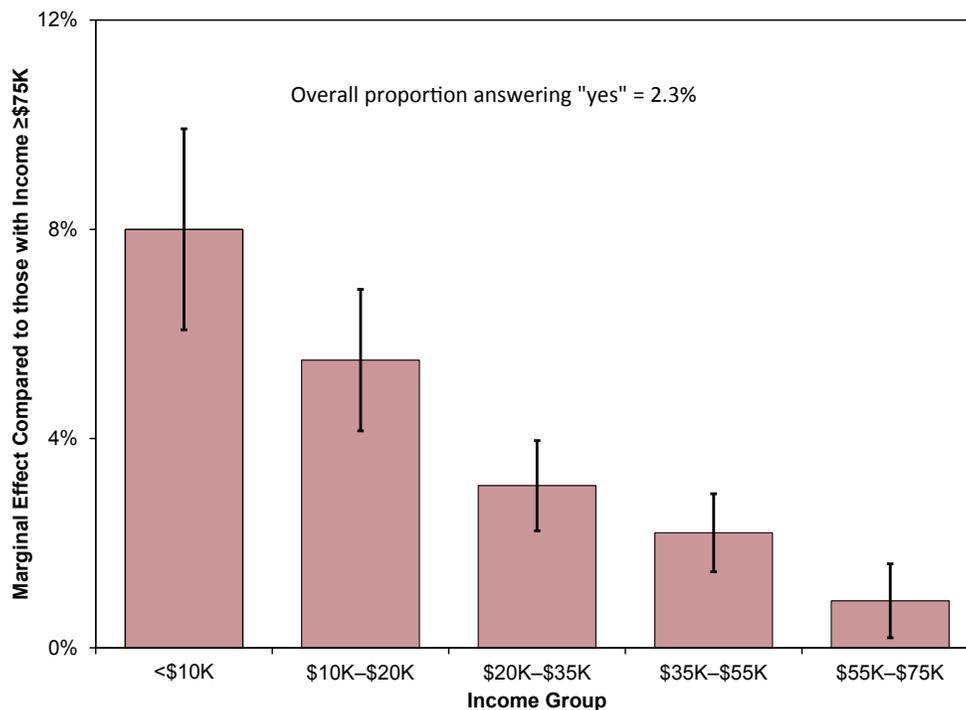


Figure 2. Marginal effects on children reported being in fair or poor health.

Source: Authors’ calculations based on National Health Interview Survey, 2001–2003, from the National Center for Health Statistics.

Note: Error bars represent 95 percent confidence intervals.

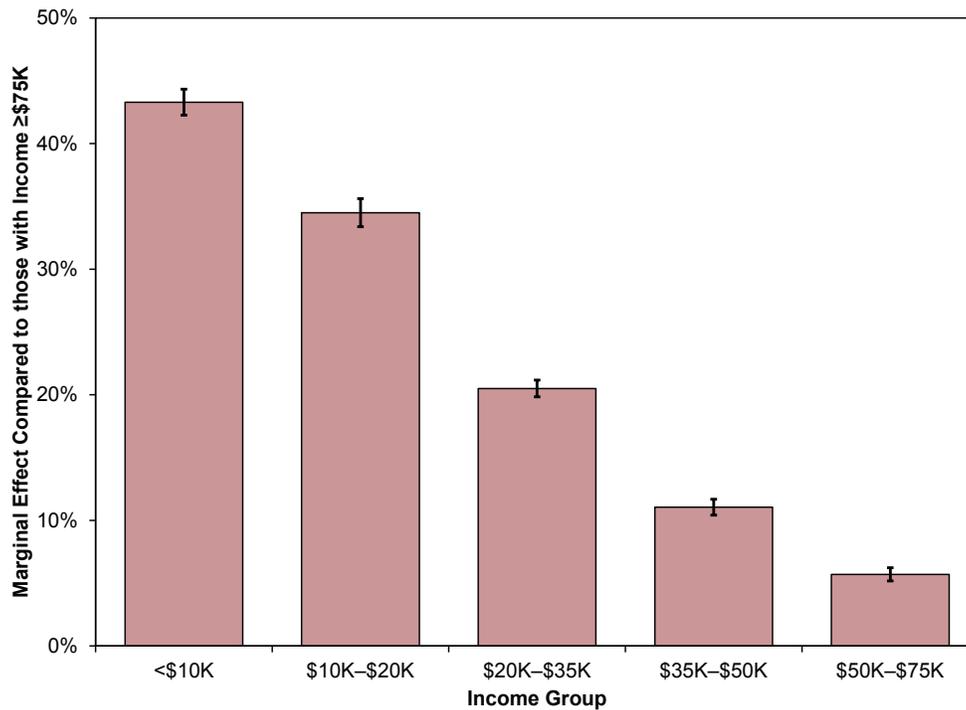


Figure 3. Marginal effects on adults reporting fair or poor health.

Source: Authors' calculations based on Behavioral Risk Surveillance System, 2005–2008, from the Centers for Disease Control and Prevention.

Note: Error bars represent 95 percent confidence intervals.

Change in gradient strength

Although the income-health gradient can be observed both across nations and over time, the steepness varies considerably. This variation may reflect the degree of inequality in different countries or at different points in history, differential access and use of care, or differing health habits.

Changes over time

It has been well-documented that the United States has experienced a large increase in financial inequality over the past forty years. This rise has occurred for almost all measures of income, wealth, wages, and earnings. For example, between 1967 and 2008, the ratio of incomes at the 90th and 10th percentiles has increased from 9.3 to 12, a rise of almost 30 percent.⁵ Some studies also document an increase in the strength of the gradient between socioeconomic status and health during this period.⁶ To add to this literature, we used two U.S. longitudinal mortality studies to look at the probability of mortality by income quartile. As Figure 4 shows, there is a striking income-mortality gradient in the United States that increased over the last two decades of the twentieth century. In the earliest period, those in the lowest quartile of income have a three-year mortality rate that is nearly twice that of those in the highest income group. By the later period, this number has increased significantly, to 2.7.

Evidence from other countries

Since the United States has been unique in its failure to provide universal health care coverage, it is often assumed that differences in socioeconomic status are largely explained by

differences in access to health care. If this was the case, we would expect the gradient to be greater within the United States than within other countries.

To test the assumption, we looked at a variety of data sources for other countries. Results from surveys in Organization for Economic Cooperation and Development countries provide evidence of an income-health gradient of a fairly consistent size, even in those countries that provide universal health coverage. These data show disparities in health by socioeconomic status in Australia, the United States, and France, though not in New Zealand. Other evidence from Australia provides results that are quite consistent with the United States in terms of general health and long-term health. Finally, data from ten European countries show disparities in self-perceived health by educational level across all countries, although the size of the disparities varies.

Disentangling the causal effect of income on health

The existence of the relationship between income and health is frequently interpreted as indicating that income causally affects health—that is, an individual's health would improve as their incomes rises. An alternate interpretation is reverse causation, that poor health can impair a person's productivity, and thus their income and wealth. Since both of these may be true, this leads to the question of the extent to which income affects health and vice versa. A third scenario is also possible: there may be an underlying common determinant of both health and socioeconomic status. For example, fac-

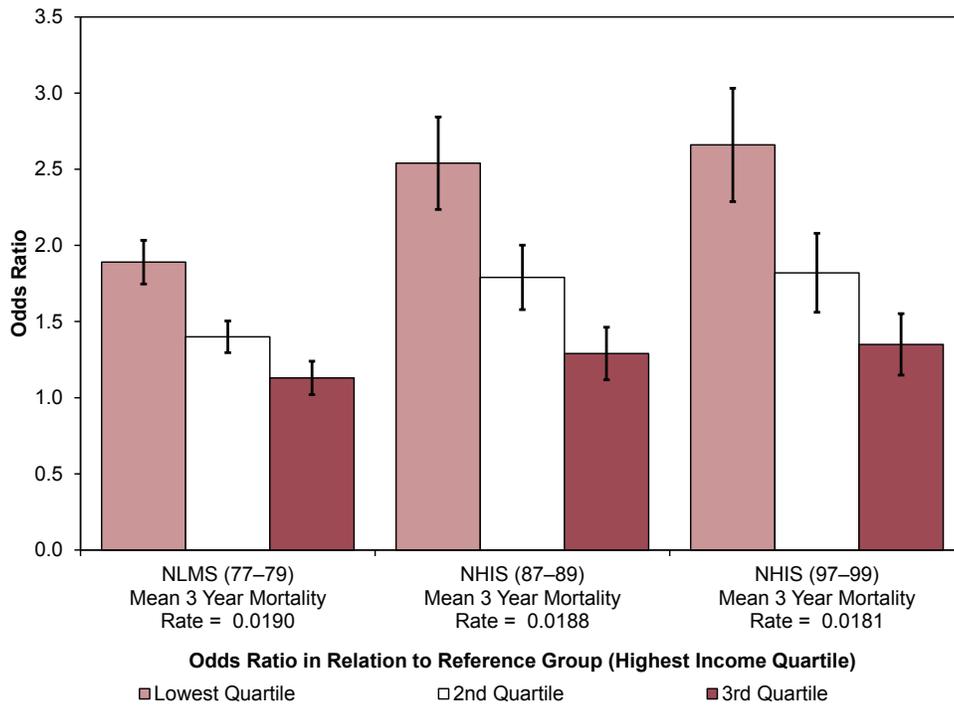


Figure 4. Odds ratio for income variables, adults 18–74.

Source: Authors' calculations based on the National Longitudinal Mortality Survey, 1987–1989, from the National Heart, Lung and Blood Institute, and Public-Use National Health Interview Survey Linked Mortality, Files 1997–1999, from the National Center for Health Statistics.

tors such as motivation or genetics could account for both low income and poor health. It is difficult for researchers to determine the causal pathways, due largely to reverse causation and possible omitted factors. We reviewed what we believe to be the most promising literature to advance our knowledge in this area.

Within the literature, the three most commonly used measures of status are income (and wealth), education, and occupation. The logic behind using income is that more income provides more routes to good health such as better nutrition, improved access to health care, greater access to opportunities for exercise, and more public safety and lower environmental risks via neighborhood choice. However, the problem of reverse correlation is likely greatest for income since poorer health almost surely reduces earning opportunities. Wealth can be thought of as accumulated income and thus may avoid this issue, since temporary poor health has less effect on long-term wealth than on short-term income. Still, chronic health conditions place demands on wealth so that the issue partly remains. Education is less problematic, but a child's own health may limit education, so the issue is still not entirely avoided. In addition, education does not completely capture access to resources and so may miss part of the link. Finally, occupation is mainly relevant for only the working-age population and those in the labor force, limiting the study to a subset of the population. The two general approaches used to investigate causality in the socioeconomic status-health gradient are (1) studying children, where issues of reverse causation are lessened; and (2) natural experi-

ments that also provide better control over causal direction. These are the two literatures we briefly review below.

Research focused on children

The theory behind using studies of children to gain insight into the link between socioeconomic status and health is that while children do not influence household income, they may be influenced by parents' socioeconomic status. More income in the family means a less-binding income constraint so that more and better inputs into a child's health may be purchased.⁷ These might include better quality medical care and food, a safer play environment, better housing, and safer neighborhoods. Occupation will also change income and potentially alter the time spent with children. Mothers who work spend less time with children but comparing across education groups, more-educated women spend much more time with children than do mothers with fewer years of schooling.⁸ Higher income may be used by parents to purchase substitute care where quality may also influence the health, including mental health, of children. More parental education may be tied to greater productivity including improving child health. More-educated parents have greater access to information regarding the health and development of their children. Following medical directions, obtaining care on the recommended schedule, meeting children's nutritional needs, and providing educational activities are all likely forms of investment in child health.

Using children to study this link is not perfect, especially when examining income effects, for several reasons. For one

thing, having a child with a chronic health problem may well reduce parents' work hours and thus income. Second, parents may reduce work time and hence income in the presence of very young children, meaning that permanent income may be mismeasured. Third, children's health may be influenced by their activities (many children develop infectious diseases when they first spend extended time with other children), but these are not the measures of health that we usually contemplate when considering the income gradient. Finally, there may be a more general problem in accurately capturing general health, chronic conditions, and health shocks of children. Even faced with these difficulties, there are major gains to studying children since doing so substantially reduces issues of reverse causality.

The first paper to explore the question of the time path of the income gradient among children is by Anne Case, Darren Lubotsky, and Christina Paxson.⁹ Using a measure of general health, they found clear evidence of an income-health gradient at all ages and a steepening with age. This paper set off a chain of other studies—some used data from other countries, which have universal health insurance, while others used alternative datasets for the United States. For example, Janet Currie and Mark Stabile used data from Canada to ask whether the same steepening pattern exists for children under universal coverage.¹⁰ In addition to replicating the findings from Case, Lubotsky, and Paxson, they also attempted to understand if the “cause” for this pattern is that low-income children are less able to recover from a health shock than higher income children or that low-income children are subject to more health shocks. Health shocks are defined by a set of chronic conditions. Their results suggest that, at least in Canada, low-income children recover as well as higher income children from a health shock, but tend to have more of them.

Alison Currie, Michael Shields, and Stephen Wheatley Price found a positive tie between income and child health in England, though without a significant increase as a child ages.¹¹ Subsequent reanalysis and extension by Case, Lee, and Paxson comes closer to replicating the U.S. pattern, although it is clearly flatter than that for the United States.¹² Rasheda Khanam, Hong Son Nghiem, and Luke B. Connelly examined Australian data and found a similar income gradient of health, though again flatter than that for the United States.¹³

Finding statistically significant income gradients of health that increase with a child's age in these three countries suggests that whatever explains this tie is not eliminated by universal health care coverage. The study for the United Kingdom suggests a flatter gradient than the studies of the United States, Canada, and Australia, yet all provide empirical evidence of both a positive tie between better child health and higher family incomes, which appears to become steeper in older children. Examining effects associated with different ways of measuring income may influence our understanding of the link between income and health. Jason E. Murasko, explored alternate dimensions of income and found that the two-year average income (and family income

compared to wage income) shows a stronger tie to child health.¹⁴ However, his use of only two years of income casts some doubt on the reliability of his comparison of permanent versus current income. Jason Fletcher and Barbara Wolfe use a longer panel and find that the income gradient is greater using permanent income than using either current income or a two-year rolling average.¹⁵ Since current income may be more subject to adverse effects from the child's health problems, this pattern provides some support for the causal pathway from income to health.

Is the effect of income cumulative? The approach used in both Khanam, Nghiem, and Connelly and Murasko is to use the earliest or prior health status to capture the influence of income on children prior to the age under study.¹⁶ Thus they suggest that including prior health captures the influence of income on health up until the most recent period of time. Under this perspective, estimates of the tie between income and health in the current period capture only the marginal influence of income on health. This approach reduces the coefficient on income but still retains the overall pattern of results.

Might other factors lie behind the measured income gradient? A few studies add parental health as a possible correlate of income that might be tied to the observed gradient. The addition of parent's health by Khanam, Nghiem, and Connelly reduces the statistical significance of income as a determinant of a child's health, though the steepening pattern as a child ages remains.¹⁷ The authors suggest that this is a way in which income influences health; that is, a parent's poorer health is tied to lower incomes so that by including this channel the direct influence of income is reduced.

Overall, the existing literature confirms that children's health is tied to income with some steepening as children age, particularly through mid-childhood, and that universal health care is not sufficient to significantly reduce, let alone eliminate, this income gradient. Taken together, the papers provide evidence of an increasing income gradient as children age though why that is the case is only minimally addressed in this research.¹⁸ A number of studies have also indicated that childhood socioeconomic status conditions are critically important in determining life expectancy and health status as an adult more generally.¹⁹

The strength of the tie between socioeconomic status and health varies across the studies, in part reflecting differences in the country studied (and access to care in that country); the exact measure of health and of socioeconomic status used; and the time period and the precise hypothesis under study—that is, whether cross-sectional or panel data are used as well as the additional factors controlled for in the estimates.

Natural experiments linking income and health

The next and last set of papers we review are those that attempt to use natural experiments or changes in policy in order to try to examine the causal link between income or

socioeconomic status and health. In an experimental setting, we could easily identify the effect of income on mortality by randomly assigning large additions to income to one group while providing no additional assistance to another. Any difference in health outcomes across the two groups could be attributed to the higher incomes, since prior to “treatment” the two groups were on average identical with the only difference being the addition to income. However, this ideal experiment is very unlikely to be implemented in a developed country context as the cost would be prohibitive. In lieu of an actual experiment, the basic idea behind the natural and quasi-experimental literature is to mimic the properties of random assignment trials using field data. If in certain populations a portion of income (or education) is determined by a factor that is not reflective of underlying health, then it may be possible to trace out the health benefits of income (or education).

For example, economists have examined whether the increase in education generated by policies such as compulsory schooling, an increase in access to colleges, and the Vietnam draft have altered health outcomes.²⁰ In these instances, education levels are increased by some external event (for example, changes in state laws on compulsory education); if the same group affected by the change in laws also experiences improved health outcomes, this provides support for the conclusion that education and health are causally related. The papers described above all find improved health outcomes from greater education. However, recent work by Damon Clark and Heather Royer find that large changes in education produced by an increase in compulsory education in the United Kingdom had no effect on adult mortality.²¹

Similar work exploits variation in income produced by external factors such as winning the lottery. Among lottery players, the probability of winning a large prize is solely a function of the amount of tickets purchased and, as a result, winners are determined by chance. As long as the amount of lottery tickets is not reflective of underlying health, winners and losers are therefore functionally randomly assigned. If following a ticket purchase winners have better health than losers, then the results indicate that among lottery players, income is protective of health.²²

In contrast to this work, there are mixed results across the different types of natural experiments concerning the role that income plays in health with some finding large benefits, some finding no effect, and others finding an increase in mortality from higher income.²³ The variance in the results for this literature is best illustrated in Jérôme Adda, James Banks, and Hans-Martin von Gaudecker, who found that an increase in the permanent income for cohorts has no effect on self-reported health status or self-reported chronic conditions, but it increased smoking and reduced mortality.²⁴

Research in Mexico focusing on an experimental conditional cash transfer program called *Progressa* (now known as *Oportunidades*) found that increases in family income are tied to improvements in health. In this experiment, households

received cash transfers if their children attended school or parents took children to medical providers to receive preventive care such as vaccinations. The findings of the experiment suggested that a doubling of the cumulative cash transfer was associated with a decrease in stunting, a decrease in body mass index for age percentile, lower prevalence of being overweight, and an increase in height for age. Based on the success of this program, related experiments were tried elsewhere, including in Harlem. Initial evaluation of the Harlem experiment did not find a statistically significant positive income effect on health or education, and the program has since been discontinued.²⁵

Evidence from expansions of federal programs is also contradictory. Douglas Almond, Hilary Hoynes, and Diane Whitmore Schanzenbach found that expanding food stamps led to improvements in infant health through higher birth weights, lowered risk of low birth weight infants, and lower infant mortality.²⁶ However, these results were not replicated when Janet Currie and Enrico Moretti studied the introduction of food stamps in California.²⁷ William Evans and Craig Garthwaite take advantage of 1993 expansions of the Earned Income Tax Credit to examine the effect of higher transfer payments on the health of low-income women and find that women most likely to receive higher payments as a result of the expansions have better self-reported physical and mental health, in addition to lower counts of risk levels of biomarkers.²⁸

Other studies make use of more unusual changes in policies or particular populations, such as the reunification of Germany on the health of those in the former East Germany, and the influence of casino-based funds on health of American Indians. These studies provide evidence that increases in income lead to improvements in health—and particularly mental health—but in general the effects are relatively small. The changes in health in these studies tend to be measured for short periods of time so they leave open the question of whether or not there are longer term effects on health that may be larger.

The two studies on American Indians that study the influence of increased income based on the initiation of casinos suggest the possibility that there may be a greater influence on health including mental health when the income of an entire community is raised rather than only that of a single family.²⁹ The first of these studies looks at children over time in the Smoky Mountains, finding improvement in mental health for a sub-set of American Indian children living on a reservation that acquires a casino during the period of study; the latter uses data over about fifteen years to identify the influence of casinos on family income and through family income on health, health-related behaviors, and mental health days. In the latter study, income was tied to improvements in the majority of health measures and in some health-related behaviors and mental health measures.

A unique study focuses on relative status within an already-affluent population by examining mortality risk reduction

as a result of winning an Academy Award versus being nominated but not selected. The win then is likely to produce higher future income as well as feelings of security and well-being.³⁰ The findings of a 28 percent reduction in death rates for those winning an Oscar for best actor or actress suggest a considerably larger influence than that suggested by the other studies.³¹ However, the effect was reversed when done for screenwriters, which the researchers speculate may reflect the unique norms and culture of screenwriters.³²

Conclusion

The existence of a socioeconomic status-health gradient is well established. The gradient appears in virtually all countries and across a wide range of ages. However, the source of this gradient and thus the cause of major disparities in health is much less clear. Evidence using children certainly suggests that family income influences health, but the evidence from independent changes in income is far from clear. Importantly, although much work has been done in an attempt to identify the mechanisms behind the gradient, it is not possible to fully explain observed differences in health by income. Is it that higher incomes are used to purchase more health, yielding inputs such as better nutrition and housing? That better-educated persons use health care more effectively? That those in higher-prestige occupations face less risk? Or is it that stress and anxiety, tied to low incomes and job uncertainty, result in poor health? Future research is needed to answer these questions. We believe that no single explanation is likely to fully explain the gradient. ■

¹This article is based on W. Evans, B. Wolfe, and N. Adler, "The SES and Health Gradient: A Brief Review of the Literature," in *The Biological Consequences of Socioeconomic Inequalities*, eds. B. Wolfe, W. Evans, and T. E. Seeman (New York, Russell Sage Foundation: 2012).

²A. Case and C. Paxson, "Stature and Status: Height, Health and Labor Market Outcomes," *Journal of Political Economy* 116, No. 3 (2008): 499–532; and A. Singh-Manoux, J. E. Ferrie, T. Chandola, and M. G. Marmot, "Socioeconomic Trajectories across the Life Course and Health Outcomes in Midlife: Evidence for the Accumulation Hypothesis?" *International Journal of Epidemiology* 33, No. 5 (2004): 1072–1079.

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⁴For the adult measures, we used data from the Behavioral Risk Factor Surveillance System, an annual cross-sectional sample of the U.S. noninstitutionalized population started by the Centers for Disease Control and Prevention in 1984.

⁵U.S. Census Bureau, Table A-3: Selected Measures of Household Income Dispersion: 1967 to 2010, Available at: <http://www.census.gov/hhes/www/income/data/historical/inequality/IE-1.pdf> (accessed September 4, 2012).

⁶See, for example, E. M. Crimmins and Y. Saito, "Trends in Healthy Life Expectancy in the United States, 1970–1990: Gender, Racial, and Educational Differences," *Social Science and Medicine* 52, No. 11 (2001): 1629–1641.

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and S. M. Bianchi, J. P. Robinson, and M. A. Milkie, *Changing Rhythms of American Family Life* (New York: Russell Sage Press, 2007).

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¹¹A. Currie, M. A. Shields, and S. Wheatley Price, "The Child Health/Family Income Gradient: Evidence from England," *Journal of Health Economics* 26, No. 2 (2007): 213–232.

¹²A. Case, D. Lee, and C. Paxson, "The Income Gradient in Children's Health: A Comment on Currie, Shields, and Wheatley Price," *Journal of Health Economics* 27, No. 3 (2008): 801–807.

¹³R. Khanam, H. S. Nghiem, and L. B. Connelly, "Child Health and the Income Gradient: Evidence from Australia," *Journal of Health Economics* 28, No. 4 (2009): 805–817.

¹⁴J. E. Murasko, "An Evaluation of the Age-Profile in the Relationship between Household Income and the Health of Children in the United States," *Journal of Health Economics* 27, No. 6 (2008): 1489–1502.

¹⁵J. Fletcher and B. Wolfe, "Increasing Our Understanding of the Health-Income Gradient," Paper presented at the 66th Annual Congress of the International Institute of Public Finance meetings. Uppsala, Sweden (August 23–26, 2010).

¹⁶Khanam, Nghiem, and Connelly, "Child Health and the Income Gradient: Evidence from Australia"; and Murasko, "An Evaluation of the Age-Profile in the Relationship between Household Income and the Health of Children in the United States."

¹⁷Khanam, Nghiem, and Connelly, "Child Health and the Income Gradient: Evidence from Australia."

¹⁸These findings are consistent with an interpretation that the prevalence of disease increases with age, and this greater variation allows more opportunities to detect disparities by family income.

¹⁹See, for example, Case and Paxson, "Stature and Status: Height, Health and Labor Market Outcomes"; and P. Frijters, J. P. Haisken-DeNew, and M. A. Shields, "The Causal Effect of Income on Health: Evidence from German Reunification," *Journal of Health Economics* 24, No. 5 (2005): 997–1017. For a much longer and well-exposed paper on this literature up to 2008, see J. Currie, "Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and Human Capital Development," *Journal of Economic Literature* 47, No. 1 (2009): 87–122.

²⁰See, for example, A. Lleras-Muney, "The Relationship between Education and Adult Mortality in the United States," *Review of Economic Studies* 72, No. 1 (2005): 189–221; J. Currie and E. Moretti, "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings," *Quarterly Journal of Economics* 118, No. 4 (2003): 1495–1532; and D. de Walque, "Does Education Affect Smoking Behaviors? Evidence Using the Vietnam Draft as an Instrument for College Education," *Journal of Health Economics* 26, No. 5 (2007): 877–895.

²¹D. Clark and H. Royer, "The Effect of Education on Adult Mortality and Health: Evidence from England," *American Economic Review*, accepted for 2013 publication.

²²There are still issues of selectivity with this study: first, it uses only lottery ticket buyers, who may be unique especially in terms of risk-taking, and two, lottery buyers who did not win are hard to identify and so the sample is incomplete.

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²⁴J. Adda, H.-M. von Gaudecker, and J. Banks, “The Impact of Income Shocks on Health: Evidence from Cohort Data,” *Journal of the European Economic Association* 7, No. 6 (2009): 1361–1399.

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²⁸W. Evans and C. L. Garthwaite, “Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health,” NBER Working Paper No. w16296. Cambridge, MA: National Bureau of Economic Research, (2010).

²⁹E. J. Costello, S. N. Compton, G. Keeler, and A. Angold, “Relationships between Poverty and Psychopathology: A Natural Experiment,” *Journal of the American Medical Association* 290, No. 15 (2003): 2023–2028; and B. Wolfe, J. Jakubowski, R. Haveman, and M. Courey, “The Income and Health Effects of Tribal Casino Gaming on American Indians,” *Demography* 49, No. 2 (2012): 499–524, doi: 10.1007/s13524-012-0098-8.

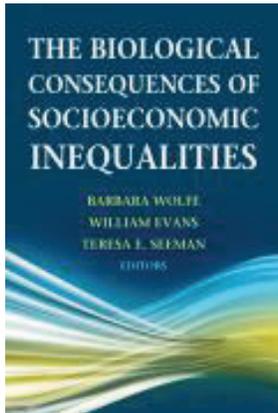
³⁰D. A. Redelmeier and S. M. Singh, “Survival in Academy Award-Winning Actors and Actresses,” *Annals of Internal Medicine* 134, No. 10 (2001): 955–962.

³¹While this was the case for actors and actresses, a subsequent study of screenwriters did not show a difference. Perhaps the gain comes from broader esteem and most of that seems directed to the generally better known group—actors and actresses. In another study of this sort, entrants into the Baseball Hall of Fame were studied and it showed that the longer they had to wait to be elected, the shorter their lifespan. See D. Becker, K. Chay, and S. Swaminathan, “Mortality and the Baseball Hall of Fame: An Investigation into the Role of Status in Life Expectancy,” iHEA 2007 6th World Congress: Explorations in Health Economics Paper, (2007).

³²D. A. Redelmeier and S. M. Singh, “Longevity of Screenwriters Who Win an Academy Award: Longitudinal Study,” *British Medical Journal* 323, No. 7327 (2001): 1491–1496.

The Biological Consequences of Socioeconomic Inequalities

Barbara Wolfe, William Evans, and Teresa E. Seeman, Editors



Thousands of studies across a variety of disciplines have documented that people with larger incomes and better education tend to have better health and live longer. This pattern holds across all ages and in all countries that have been studied, and for virtually all measures of health, suggesting a biological dimension of inequality. However, scholars have only just begun to understand the complex mechanisms behind the relationship between financial well-being and human physiology. *The Biological Consequences of Socioeconomic Inequalities* explores these interactions by incorporating insights from the social and biological sciences to quantify the biology of disadvantage and learn more about how socioeconomic status gets under the skin.

The SES and Health Gradient: A Brief Review of the Literature

William Evans, Barbara Wolfe, and Nancy Adler

Promise of Biomarkers in Assessing and Predicting Health

Arun S. Karlamangla, Tara L. Gruenewald, and Teresa E. Seeman

Biological Imprints of Social Status: Socioeconomic Gradients in Biological Markers of Disease Risk

Tara L. Gruenewald, Teresa E. Seeman, Arun S. Karlamangla, Elliot Friedman, and William Evans

Dissecting Pathways for Socioeconomic Gradients in Childhood Asthma

Edith Chen, Hannah M. C. Schreier, and Meanne Chan

Cardiovascular Consequences of Income Change

David H. Rehkopf, William H. Dow, Tara L. Gruenewald, Arun S. Karlamangla, Catarina Kiefe, and Teresa E. Seeman

Cognitive Neuroscience and Disparities in Socioeconomic Status

Jamie Hanson and Daniel A. Hackman

Brain Development and Poverty: A First Look

Jamie Hanson, Nicole Hair, Amitabh Chandra, Ed Moss, Jay Bhattacharya, Seth D. Pollak, and Barbara Wolfe

Reversing the Impact of Disparities in Socioeconomic Status over the Life Course on Cognitive and Brain Aging

Michelle C. Carlson, Christopher L. Seplaki, and Teresa E. Seeman

Conclusions

William Evans, Teresa E. Seeman, and Barbara Wolfe