Parental Socioeconomic Status, Child Health, and Human Capital

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GLOSSARY

Fetal origins hypothesis – a biological theory suggesting that the environment an individual is exposed to as a fetus can have long term effects on his or her health.

Grossman health model – a theoretical model describing how an individual's health relates to his or her previous health and choices of medical inputs, such as medical care, food and housing.

Sibling fixed effects – a regression analysis technique that compares siblings to each other in order to remove the statistical bias due to family background.

ABSTRACT

Parental socioeconomic status (SES) may affect a child's educational outcomes through a number of pathways, one of which is the child's health. This essay asks two questions: What evidence exists about the effect of parental SES on child health? And, what evidence exists about the effect of child health on future outcomes, such as education? We conclude that there is strong evidence of both links.

Introduction

Investments in education pay off in the form of higher future earnings, and differences in educational attainments explain a significant fraction of the adult variation in wages, incomes, and other outcomes. But what determines a child's educational success? Most studies point to family background as the primary factor. But why does background matter? While many aspects are no doubt important, research increasingly implicates health as a potentially major factor. The importance of health for education and earnings suggests that if family background affects child health, then poor child health may in turn affect education and future economic status.

What evidence exists about the effect of parental socioeconomic status (SES) on child health? And, what evidence exists about the effect of child health on future outcomes, such as education? A great deal of evidence shows that low SES in childhood is related to poorer future adult health (Davey Smith et al., 1998). The specific question at the heart of this review is whether low parental SES affects future outcomes through its effects on child health. In most of the studies cited, SES is defined by parental income or poverty status, though some measure SES through residential neighborhood or parental schooling attainment. This review focuses primarily on children from developed countries because it is more obvious why the common and severe health problems of children in many developing countries might impede human capital development.

Does Parental Socioeconomic Status Affect Child Health?

External Benefits of Parental SES

Parental SES may impact both parents' own health and the health of their children. Schooling attainment, in particular, has a stronger correlation with a parent's own good health than does income or other measures of SES (Grossman, 2007). The association between education and parents' own health is only partially explained by better health knowledge and may be better explained by the fact that more highly educated parents tend to exhibit better health behaviors. Even after controlling for income, parents with more schooling smoke less, drink less alcohol, exercise more and work less often in dangerous occupations. They also adhere more carefully to prescribed medical therapies and are more likely to use newer medical technologies to address health problems. These tendencies may be caused by education, or they may indicate that people who plan for the future better tend both to pursue more schooling and to behave in healthier ways.

This article will focus, however, not on the internal benefits of parental SES (i.e. for parents' own health) but on the external benefits of parental SES for children's health. Through what channels might these benefits flow? In the health model presented by Grossman (2000), a health production function Q_t describes how a child's current health depends on health inputs like medical care, food, and housing, as well as previous health levels Q_{t-1}, Q_{t-2}, etc. This is similar to an education production function that models how a child's test score depends on inputs like teachers and textbooks as well as previous test scores. Grossman's health model yields several insights into how parental SES might affect child health. First, and perhaps most obviously, budget constraints bind more in

poorer families, preventing them from buying more or better material health inputs such as better quality medical care and food, as well as safer housing and neighborhoods.

Second, SES affects what parents choose to do with the health inputs they can afford, as parents of lower SES may have different past experiences with the health care system, or different health preferences, or different health beliefs (e.g. whether it is normal for a child to wheeze). Parental education may play a particularly important role in this regard. Maternal schooling is strongly correlated with neonatal mortality rates and children's overall health, which may indicate the importance of health knowledge but is more likely explained by the association between schooling and various health behaviors (Grossman, 2007). More highly educated mothers smoke less, drink less, take more vitamins and receive more prenatal medical care. In other words, they treat health inputs that impact their children, like cigarettes and alcohol, differently than do less educated mothers. Once these inputs are controlled for, maternal schooling has little additional association with child health, suggesting that parental education may affect child health largely through the use of such health inputs.

Finally, children of lower SES families are likely to have lower health status at birth. This is not necessarily due to a worse genetic endowment but may stem from differing environmental triggers that activate certain genes (Rutter, 2006). Thus, a low SES child may have poor health at birth because of the circumstances surrounding gestation and birth, rather than because of worse genetic endowments. All of the above may be mechanisms through which SES affects child health.

Evidence

Correlation

Differences in the health of high and low SES children are apparent at birth. Data from Britain and California show that low SES children are more likely to have low birth weight than high SES children. Maternal reports of overall child health from the U.S., Britain and Canada all show that the health gap between high and low SES children continues through early childhood and beyond (Currie, Shields and Wheatley Price, 2007). The health gaps are smaller in Britain and Canada than in the U.S., perhaps due to universal health insurance coverage, but are still present.

Variations in the incidence of health insults (such as hospitalizations or new diagnoses of chronic conditions) may be of particular importance in explaining the gap in health status between rich and poor. Evidence from the U.S., Britain and Canada suggests that poor children are more likely to receive health insults and to suffer from chronic conditions than rich children (Currie and Lin, 2007). More than twice as many poor children than non-poor children are reported by their mothers to be in less than "very good" health, a gap that increases as children age. Further, 32.4% of poor children suffer from a chronic condition, compared to 26.5% of non-poor children, a gap that would likely be even larger if differences in diagnosis probabilities were accounted for. Such chronic conditions also limit poor children more than non-poor children. 11.4% of poor children report being limited by their chronic conditions compared to 7.0% of non-poor children. The fraction of children with a limitation due to a chronic condition rises with age, and rises more sharply for poor children than for others. By their teenage years,

poor children have almost double the probability of being limited by their chronic condition: 14.1% compared to 7.8% of non-poor children.

Theoretical models suggest that persistent poverty is likely to have worse effects on health than transitory poverty. Though more research is needed, evidence from several studies suggests that persistent poverty affects child mental health, particularly aggressive behavior, more than current poverty (Strohschein, 2005).

Causation

The fact that children of low SES parents are less healthy on average than other children does not necessarily imply that low SES causes poor child health. A third factor such as poor parental health may, for example, cause both poverty and poor child health. Alternatively, poor child health may cause low SES by reducing parental earnings. Identifying causal effects matters greatly because interventions to improve parental SES will not necessarily improve child health if parental SES does not directly affect child health. Unfortunately, relatively little literature attempts to identify causal impacts of parental SES on child health in a developed country context, perhaps because of the difficulty of finding interventions that affect parental SES but that do not also directly affect children's health. Research in this area uses one of two approaches. The first approach is to ask whether the correlation between SES and child health remains once other variables are controlled for. The second is to examine the effect of natural experiments that randomly change some parents' SES relative to a control group.

Mother's education, one measure of SES, seems to have a positive impact on child health. In the U.S., the great expansion of higher education in the 1960s and 1970s raised women's education levels, which in turn improved infant health as measured by birth weight and gestational age (Currie and Moretti, 2003). The effect may have occurred through increased rates of marriage and prenatal care, as well as through substantial reductions in smoking.

Income itself, as a measure of SES, seems to have relatively little effect on child health. Welfare-to-work experiments, for example, have had little impact on child health, either positive or negative. Income may, however, matter more in a developing country context. For example, black South African girls increased their height-for-age when their grandmothers started receiving old-age pensions, suggesting increased investment in nutrition (Duflo, 2000). Finally, the state of the economy may impact child health. Dutch citizens born during recessions have higher mortality rates at all ages compared to those born just prior to the recession, though the precise pathway for this effect is unclear (Van den Berg, Lindeboom, and Portrait, forthcoming).

Studies of American and British families find that the apparent effect of income on child mental health is considerably lessened once other factors, such as parenting skills and physical home environment, are controlled for (Berger, Paxson and Waldfogel, 2006). Estimates from the American study suggest that even cash subsidies to bring every family up to the poverty line would not eliminate the observed gaps in child outcomes.

Neighborhoods are often said to be an important pathway for SES to affect outcomes. Some evidence on this point comes from a U.S. social experiment that randomly assisted some public housing residents to move to low poverty neighborhoods.

This "Moving to Opportunities" experiment improved the mental health of girls through reductions in generalized anxiety disorders and psychological distress (Orr et al., 2003). Curiously, there was no such positive effect for boys.

Some recent research has attempted to control for unobserved family background characteristics by examining children born to the same mother (i.e. estimating models with sibling fixed effects). Some studies of American mothers suggest that on average, maternal income during pregnancy does not affect the probability of having a low birth weight child, but that it does matter if the mother herself had a low birth weight. Evidence from California birth records suggests that, even among women with the same mother, being born in a poor area increased the probability of being low birth weight and of later delivering a low birth weight baby (Currie and Moretti, 2007). One final piece of evidence that maternal SES affects infant health comes from examination of the health improvements black women experienced as a result of the U.S. Civil Rights movement. Infants of black women who themselves had healthier infancies as a result of the Civil Rights movement (which improved hospital access for blacks in southern states) show large gains in birth weight relative to the infants of black women born just a few years earlier (Almond, Chay, and Greenstone, forthcoming).

In summary, it is difficult to prove that the strong and exceedingly robust correlation between parental SES and child health is a causal relationship. The literature attempting to do so is under developed. There is, however, evidence that maternal SES early in the child's life matters, and that child mental health may be particularly susceptible to the effects of early deprivation.

Does Child Health Affect Future Outcomes?

Possible Channels

Poor child health may impact adult labor supply and productivity through two channels. First, it may damage adult health. Cohorts that suffer high death rates in childhood may also show high death rates in adulthood, in part because of the direct effects of childhood health conditions on future morbidity. In rich countries, cohorts that suffer a higher disease burden in childhood have higher adult death rates, though in poor countries the relation is reversed because only relatively healthy people survive to adulthood (Bozzoli, Deaton and Quintana-Domeque, 2007). In the U.S., adults' reports about their overall childhood health are highly correlated with current adult outcomes, a pattern that continues to hold even once family background is controlled for by comparing siblings to each other. Thus, adult siblings who had better health in childhood have 24 percent higher incomes, higher wealth, more weeks worked per year, and a higher growth rate of income (Smith, forthcoming). Comparing siblings to each other reduces the apparent effect of childhood health on future education, suggesting that childhood health may affect future income through mechanisms other than educational attainment. Sickly children may, for example, be less able to work hard as adults.

Second, poor child health may impair children's' educational attainment and thus skill acquisition. Among older children, school absences may be a mechanism for health to affect education, though overall absenteeism is quite small for both poor and non-poor children. It is more likely that poor health impacts skill acquisition by impairing

children's ability to learn while they are in school. Conditions such as anemia and lead poisoning have this effect, though today they are relatively rare in developed countries. Conditions such as tooth decay and ear infections are much more common and might therefore have a greater overall impact. Mental health conditions may be a particularly important mechanism because they are common and have worse effects on schooling attainment than most physical chronic conditions.

Evidence

In developing countries, children in poor health tend to have lower educational attainments, but surprisingly little examination of this relationship has occurred in developed countries. Data on older Americans show that the apparent effect of a retrospective measure of childhood SES on future health, education, and income shrinks when child health measures are included (Luo and Waite, 2005). This result implies that child health may explain some of the impact of low childhood SES on future outcomes.

The primary deficiency of this literature is that correlations between child health and future outcomes, including those mentioned above, may be due to other characteristics of households that are associated both with poor child health and worse outcomes. Until the last decade, most studies claiming a causal connection between child health and future educational attainment suffered from methodological weaknesses, but in the past decade an outpouring of research on this topic has paid careful attention to the causal question. The remainder of this section examines specific child health problems that may work through the two channels described above, starting with conditions in utero and low birth weight, for which there is much causal evidence, and continuing with nutrition, mental health, asthma, acute conditions and environmental toxins, for which there are fewer causal studies.

Conditions in Utero

Increasing numbers of studies have focused on the hypothesis that fetal conditions are related to adult risk of disease, an idea that has become known as the "fetal origins" or "Barker" hypothesis (Barker, 1998; Gluckman and Hanson, 2005). This literature strongly suggests that conditions in utero affect not only birth weight but features such as basic metabolism, which in turn affect future health outcomes. Fetuses starved in utero may develop more efficient metabolisms that raise the risk of future obesity, heart disease and diabetes. Because adult health is strongly linked to adult economic well-being, this suggests a relationship between health in utero and future outcomes.

The most compelling tests of the hypothesis look for sharp exogenous shocks in fetal health caused by conditions outside the mother's control. Dutch adults who were in utero during the 1944-45 famine caused by Nazi occupation were more likely to suffer various health impairments including nervous disorders, heart disease, and antisocial personality disorders. Swedes who were in utero when the 1986 Chernobyl disaster exposed their mothers to low dose fallout were less likely to qualify for high school and had lower grades (Almond, Edlund and Palme, 2007). Americans who were in utero during the 1918 influenza epidemic were much less likely to graduate from high school, had lower wages, were more likely to be poor and receiving transfer payments, and as

adults suffered more from schizophrenia, diabetes and stroke (Almond, 2006). In general, health shocks in early life due to wars, famines, and other crises can have large, lasting effects on health.

Cognitive functioning can also be directly affected by conditions in utero and in infancy. For example, maternal alcohol consumption can lead to permanent brain damage, as can trauma during the birth itself. Extreme deprivation in early childhood, such as that experienced by some Romanian orphans in state-run nurseries, demonstrably impairs cognitive functioning (O'Connor et al., 2000). Severe health insults in utero or in early childhood clearly can cause permanent cognitive impairments, but questions remain about how sensitive these "sensitive periods" are and whether damage due to less extreme deprivation is noteworthy or widespread.

Birth Weight

More direct evidence is provided by recent literature linking low birth weight to negative future outcomes. In the U.S., low birth weight babies have a much higher infant mortality rate than their heavier counterparts (Conley et al., 2003). They also have lower average scores on a variety of tests of intellectual and social development. Low birth weight British children have lower test scores, educational attainments, wages, and probabilities of being employed as adults, even conditional on many measures of family background (Case, Fertig and Paxson, 2005).

Many of the studies exploring the effect of birth weight on future outcomes compare siblings or twins in an attempt to control for unobserved family characteristics that might otherwise bias the results. Some small-sample studies that do this in an American context conclude that lower birth weight siblings tend to attain less education. More recently, several studies have employed individual-level national vital statistics (birth certificate) data in Canada, Norway and Scotland to examine this question. All of these studies show a link between low birth weight and lower educational attainment, and some show a negative effect on height and intelligence, even among siblings or twins (Black, Devereux and Salvanes, 2007). Similar findings occur in the U.S., where a number of studies confirm that lower birth weight siblings (or twins) attain less education than their higher birth weight counterparts (Currie and Moretti, 2007). Data from the U.S. also suggests that lower birth weight is associated with a higher probability of living in a poor area, a lower probability of being married, lower earnings, worse health, and worse cognitive abilities.

Nutrition

Nutrition may play a significant role in the child's cognitive development. Randomized trials in developing countries like Guatemala, for example, indicate that poor nutrition can harm cognition (Maluccio et al., 2006). It is less obvious that nutritional supplementation should have a large effect on the cognitive achievement of children in richer countries. Several U.S. studies have, however, found positive effects of prenatal participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), which provides coupons that can be redeemed for specific foods to women, infants, and children who are deemed to be "nutritionally at risk" (Kowaleski-

Jones and Duncan, 2002). Children of mothers participating in WIC had better outcomes on cognitive tests even when compared to a control group of higher income, better educated women also receiving prenatal care in clinic settings. Children born while their mothers participated in WIC show better temperament, though not better motor or social skills, than their siblings born while their mothers were not participating. These studies underline the importance of the prenatal period.

Further evidence on the importance of nutrition comes from the fact that height is a good measure of a population's average health. Interestingly, the well-established relationship between adult height and earnings disappears when early childhood cognitive test scores are controlled for (Case and Paxson, 2006). Since much of the variation in adult height is due to childhood nutrition, this suggests that that poor childhood nutrition likely affects both cognitive performance and adult height, leading to the observed correlation between height and earnings.

Mental Health

The prevalence and importance of child mental health problems have been increasingly recognized. Approximately one in five children and adolescents in the U.S. exhibit some impairment from a mental or behavioral disorder, 11 percent have significant functional impairments, and 5 percent suffer extreme functional impairment. Moreover, mental health problems are one of the leading causes of days lost in the work place because they strike many people of working age. Retrospective questions asked to U.S. adults suggest that those with early onset psychiatric problems were less likely to have graduated from high school or attended college. Children's mental health problems are usually grouped into four categories: anxiety, depression, hyperactivity and conduct disorders (aggressive or anti-social behavior). The evidence to date suggests that these last two externalizing problems have the greatest impact on outcomes.

Children with behavioral problems in Britain and New Zealand have poorer schooling, earnings and employment outcomes as young adults than their counterparts without such problems. Hyperactivity and conduct disorders seem to cause these negative outcomes, while anxiety and depression have little effect. U.S. data also suggests that children with behavior problems at young ages are less likely to graduate from high school or to attend college, even after conditioning on maternal characteristics (McLeod and Kaiser, 2004). American children with Attention Deficit Hyperactivity Disorder (ADHD) complete less schooling and are more likely to have continuing mental health problems than a group of control children consisting either of children from the same school or to non-psychiatric patients in the same medical center (Mannuzza and Klein, 2000).

Beyond adding available controls to regression models, many of these studies do not address the possibility that the negative outcomes might be caused by other factors related to a diagnosis of mental health problems, such as poverty or the presence of other learning disabilities. Recent studies address these challenges in by comparing siblings, thus eliminating any family background characteristics as a source of bias (Currie and Stabile, 2006). In both the U.S. and Canada, siblings with high scores on an ADHD screener had lower math and reading scores and higher probabilities of being in special education or having repeated a grade than their siblings with low scores on the ADHD

screener. ADHD appears to have larger effects on academic outcomes than childhood depression, conduct disorders, or other mental problems, and the effects of ADHD are large relative to those of physical chronic conditions.

Asthma

Poor children are more likely to suffer from and be limited by asthma, the most prevalent childhood chronic condition, than are non-poor children. Though siblings with controlled asthma show no difference in achievement scores than siblings without asthma, several studies indicate that asthmatic children are more likely than similar but non-asthmatic children to have behavior problems, even when the asthma is well controlled (Calam et al., 2003). Asthmatic children are absent more frequently from school, have higher incidence of learning disabilities, and repeat grades more often. They also have lower scores on a test of school readiness skills and their parents were three times more likely to report that they needed extra help with learning, particularly if children reported that their asthma caused activity limitations. These studies suffer from the deficiency that the apparent connection between asthma and outcomes could reflect omitted third factors because asthma is more prevalent among poor and minority children. The fact that several of the studies do, however, use very homogeneous groups of children and still find behavioral differences suggests that uncontrolled asthma probably does have a causal effect on behavior.

Acute Illnesses

Poor children are more likely to suffer from acute illnesses such as tooth decay and ear infections than their richer peers. Ear infections affect most young children at one time or another and are the most common reason children visit a doctor. Roughly 5 percent of two- to four-year-old children have hearing loss because of middle ear effusion lasting three months or longer. Hearing loss can delay language development, but little research has been done to determine how important these effects might be in explaining disparities in cognitive or academic outcomes.

Environmental Toxins

One final category of health problems that may explain disparities in outcomes between poor and non-poor children is exposure to environmental toxins. The most obvious of these toxins is lead, as lead poisoning has been shown to significantly decrease IQ, and the majority of affected children are low income. Lead may also worsen children's mental health, making them more prone to anti-social behavior. Adoption of public health measures such as banning lead in paint and gasoline have, however, caused the number of U.S. children with unsafe lead levels to decline from 13.5 million in 1988 to less than one half million in 2000. Relatively little research examines the health effects of exposure to other environmental toxins at the level now generally occurring in the population. Data on possible human health effects generally comes either from animal studies, or from disastrous releases. Residents of areas near hazardous waste sites are more likely to be poor and have lower levels of education than people in the remainder of

the country so that their children's health outcomes are likely to differ even in the absence of negative health effects from exposure. Some studies try to control for observable confounding factors, but unobservable characteristics of people who live near hazardous waste sites may tend to cause bad outcomes.

One approach that avoids this omitted variable problem uses variation in pollution levels stemming from implementation of the 1970 and 1977 Clean Air Acts, which caused exogenous changes in air pollution levels across counties. Counties that experienced larger air pollution reduction also experienced decreased rates of infant mortality (Chay and Greenstone, 2003). The Clean Air Acts also reduced prenatal exposure to lead, which in turn decreased infant mortality and the proportion of low birth weight babies (Reyes, 2005). Other papers account for omitted characteristics like ground water pollution and socioeconomic status by examining changes in pollution over time within single zip-code areas. These studies reveal that reducing pollutants like carbon monoxide lowers infant mortality rates, as well as hospitalization rates for childhood asthma (Currie and Neidell, 2005). These studies show that pollution can have causal effects on child health, but there has been little investigation of whether these effects have long term consequences for children's outcomes. The National Children's Study will attempt to remedy this by examining the effects of environmental exposures on 100,000 children from birth to age 21.

Can Health Account for Gaps in Children's Educational Outcomes?

In order for a given health problem to lead to a disparity in educational outcomes, the health problem must either be more prevalent among the poor or have a larger negative effect on the poor, and must also be associated with lower educational attainments. Few of the specific health problems mentioned above fit both these criteria. Mental health problems are much more prevalent among the poor and have large negative effects, but are still too rare to explain observed human capital disparities. Similarly, the long-term effects of low birth weight are statistically significant but relatively small. The same is true for many of the other specific conditions, while for some of the other large categories, such as injuries and exposure to environmental toxins, too little evidence currently exists to determine the likely long-term effects or the extent of the disparity in exposures. One exception to this generalization are the fetal injuries mentioned above, which have very large effects on future outcomes. Children of U.S. mothers infected during the flu epidemic were 15% less likely to graduate from high school, and Swedish children exposed to low-level radiation after Chernobyl were 5.6% less likely to qualify for high school. These results raise the provocative idea that one of the best ways to safeguard children's health and educational attainments may be to start with their pregnant (or pre-pregnant) mothers.

To summarize, this essay surveys literature focusing on two questions: Do parental circumstances affect child health at early ages? And does child health matter for future educational attainments? The answer to both questions appears to be "yes." It is too early to tell how important these feedbacks between health and more conventional measures of human capital may be. We know too little about the cumulative and interactive effects of health insults. The available evidence suggests that fetal health may be particularly important. We need to understand more about the reasons why poor

children suffer a higher incidence of negative health events, even in utero, so that we can do more to prevent them. Much of the literature reviewed here is extremely recent, suggesting that this topic will continue to be a fruitful area of research.

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Biographies

Janet Currie is a Professor of Economics and Chair of the Department of Economics at Columbia University. She has taught at Princeton, MIT, and at UCLA. She has served on several National Academy of Sciences panels. She is a Fellow of the Society of Labor Economists, a Research Associate at the National Bureau of Economic Research, an affiliate of the University of Michigan's National Poverty Center, and an affiliate of IZA in Bonn. She is on the advisory board of the National Children's Study and on the editorial board of the Quarterly Journal of Economics. For the past decade, her research has focused on evaluating programs for poor children and families. Much of this research is summarized in "The Invisible Safety Net: Protecting the Nation's Poor Children and Families", Princeton University Press, 2006.

Joshua Goodman is currently completing his Ph.D. in economics at Columbia University. His areas of interest include applied labor economics and public finance, with a particular emphasis on education policy. He has written papers on the design of merit-based financial aid programs, the question of whether credit constraints prevent college enrollment of poor students, and on the effects of high school curriculum requirements on students' labor market outcomes. He holds a B.A. in physics from Harvard University, an M.Phil. in education from Cambridge University, and an M.A. and M.Phil. in economics from Columbia University.