Childhood Health: Trends and Consequences over the Life Course

Liam Delaney and James P. Smith

Summary

This article first documents evidence on the changing prevalence of childhood physical and mental health problems, focusing on the development of childhood health conditions in the United States. Authors Liam Delaney and James Smith present evidence on the changing prevalence of childhood chronic conditions over time using recalled data as well as contemporaneous accounts of these childhood health problems. The raw data from both sources show sharp increases in the prevalence of most childhood physical health problems (such as asthma, allergies, respiratory problems, and migraines) over time. However, inferring trends is difficult because such data are also consistent with improved detection of childhood disease, and many of the causes of childhood disease have not worsened over time. Conclusions about rapidly rising rates of childhood physical health problems over time are premature at best, especially concerning the magnitude of trends. Documenting real changes in the prevalence of specific diseases is a high-priority research topic. In contrast, the evidence is much stronger that childhood mental health problems are becoming worse.

The authors next present new evidence on the effects of early childhood physical and mental problems on health and economic status in adulthood. They find that both childhood physical and mental health problems contribute significantly to poorer adult health. However, they also find that childhood mental health problems have much larger impacts than do childhood physical health problems on four critical areas of socioeconomic status as an adult: education, weeks worked per year, individual earnings, and family income.

Finally, the authors examine evidence regarding the efficacy of early mental health treatment for children in terms of promoting good health later on. Existing studies suggest that a combination of cognitive behavioral therapy and medication appears to be effective in the treatment of both anxiety and depression in children. However, much more research is needed on the efficacy of these childhood interventions into adulthood. Clinical trials have been too short to evaluate the long-term impacts of various forms of treatment, and these impacts are definitively long term.

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Evidence indicates that childhood health has persistent effects through adulthood on health and socioeconomic status.[1] This paper examines the changing prevalence of childhood physical and mental health conditions, particularly in the United States; considers the estimated lifetime economic costs of childhood health problems; and reviews the literature on costs and consequences of childhood interventions.

Recent work has documented the shift in developed countries from focusing on early life health crises that often result in death to identifying and treating specific chronic childhood illnesses and providing a foundation for good child mental health. At a societal level, the growing importance of childhood mental health is emphasized in several recent papers.[2] We argue that poor treatment of childhood mental health problems carries significant long-term costs not only to individuals but to large populations.

How the approximately 75 million U.S. children through age 18 are provided with the best possible conditions for good mental and physical health will affect their well-being now and have implications for America's transition to an increasingly graying society. Americans spend proportionately more of their income on health care than residents of any other country in the world, and federal, state, and local health care agencies spend more than $1 trillion each year. It is possible that the promotion of childhood health might reduce these costs in the long run.

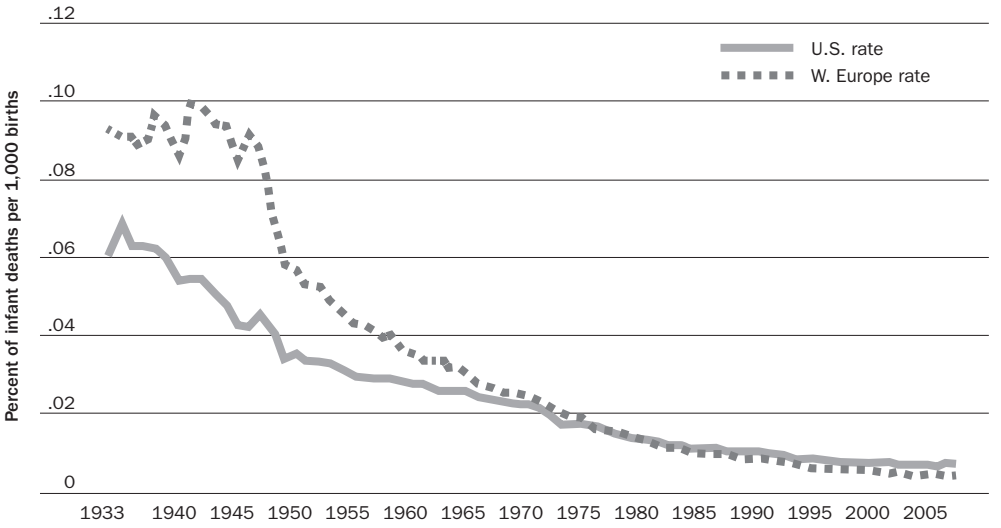
We present evidence on the changing prevalence of physical and mental health problems for American children and raise issues about the reliability of this evidence. Then we examine the lifetime economic consequences of poor health in childhood, with an emphasis on distinguishing between childhood physical and mental health. Finally, we discuss potential routes to improve outcomes for children with mental health disorders and offer suggestions for research and policy.

Global Trends in Childhood Health

Robert Fogel documents historical shifts in patterns of health through three periods: first, where infant mortality is high and life expectancy low, largely because of food shortages; second, where, although improved from the first stage, infant mortality remains high and life expectancy remains low because of infectious diseases; and third, where infant mortality falls and life expectancy increases significantly as major infectious diseases are suppressed by sanitation systems, vaccinations, improved nutrition, and other factors.[3]

Inadequate sanitation and nutrition are common in poor countries, where an estimated 7.8 percent of childhood deaths are caused by complications arising from below-normal birth weight, 6.6 percent of childhood deaths stem from unsafe sex (that is, sexual behaviors that increase the risk of contracting a sexually transmitted disease), and 6.1 percent arise from unsafe water.[4] Globally, the main causes of death among children are pneumonia (17 percent), diarrhea (17 percent), other infections (12 percent), severe neonatal infections (11 percent), premature birth (11 percent), and malaria (7 percent). The main factors implicated in child deaths in developing countries include deficiencies of zinc, iron, and iodine; poor sanitation; suboptimal breast-feeding patterns; and poor nutrition. Worldwide, deaths of children younger than age five dropped from 11.9 million in 1990 to 7.7 million in 2010, with almost half of the percentage decline occurring in sub-Saharan

Figure 1. Infant Mortality Rate in the United States and Western Europe



Source: Berkeley World Mortality Tables.

Africa, a third in South Asia, and less than 1 percentage point in high-income countries.[5]

In the United States, recent work has demonstrated a shift in patterns of childhood illness away from acute health problems and toward chronic conditions. Several recent papers have argued that, contrary to the picture of improving child health suggested by mortality data discussed below, the extent of childhood chronic physical illnesses is increasing in the United States.[6]

Changing Patterns in the United States

As outlined by David Cutler and Ellen Meara, increasing life expectancy during the first half of the twentieth century was driven largely by substantial declines in infant mortality related to improved sanitation and nutrition, while other factors such as medical improvements contributed mainly to increased life expectancy during the second half of the century.[7] Cutler, Angus Deaton, and Adriana Lleras-Muney also documented that declining infant mortality was the most significant contributor to increased life expectancy during the first half of the 1900s.[8] While medical advances occurred throughout the late twentieth century in treatments of illnesses affecting infants, infant mortality rates were already so low as a fraction of total mortality that the advances had only small effects on overall life expectancy.

Figure 1 shows trends in infant mortality since the mid-1930s in the United States and in a population-weighted average aggregate of Western European countries that have had comparable data and consistent geographical boundaries.[9] In the United States, there was a rapid decline in infant mortality rates, with the 2008 rate falling below 1 percent. Based on variation in timing and location of scientific advances, Cutler and Grant Miller estimated that improved water purification accounted for almost half of the overall mortality reduction and three-quarters of the decline in infant mortality during the first

third of the twentieth century in America.[10] Cutler and Meara attributed the continuing decline in infant mortality after the 1960s to improvements in neonatal medical care for low-birth-weight babies.[11]

From the 1930s to 1945, infant mortality rates in Western Europe were higher than in America (see figure 1). During this period, the gap actually widened as the Western European rate stalled, most likely because of the Great Depression and World War II. After the war, Western European infant mortality rates fell rapidly, converged with U.S. rates by the mid-1970s, and then fell slightly below U.S. rates. Still, both U.S. and Western European infant mortality rates are low relative to historical levels and also relative to reported rates of childhood chronic conditions.

Childhood Chronic Conditions

Figure 1 documents a marked improvement in the health of U.S. children when infant mortality is the yardstick. However, as the infant mortality rate declined during the past half-century, public attention in developed countries shifted from acute fatal health problems toward chronic problems. While there is no doubt that chronic conditions are increasing in relative importance, it is often argued that chronic childhood illnesses are increasing in absolute importance as well.

Table 1 uses the childhood retrospective module that was placed into the 2007 wave of the Panel Study of Income Dynamics (PSID) by James P. Smith.[12] The PSID has been tracking incomes and working conditions of a representative sample of American families on a yearly basis since 1967. Given the quality of its economic information, the PSID is an ideal data source to track the impact of poor childhood health on adult health and socioeconomic status. The major limitation of the PSID was the absence of information on childhood health, which was addressed by the retrospective module. This module enables us to combine childhood health data with excellent adult data on health and socioeconomic status. The information in the module focuses on the presence or absence of chronic conditions rather than on functional disabilities associated with those conditions.

Using calendar life-history methods, the initial set of questions asked respondents in the module whether—in the years up to and including age sixteen—they had any of a list of important childhood illnesses or conditions. This list included asthma, diabetes, respiratory disorders (such as bronchitis, wheezing, hay fever, shortness of breath, and sinus infection), speech impairment, allergic conditions, heart trouble, chronic ear problems or infections, epilepsy or seizures, severe headaches or migraines, stomach problems, high blood pressure, difficulty seeing with eyeglasses, mumps, measles, chicken pox, and three indicators of childhood mental health problems (depression, drug or alcohol problems, and other psychological problems). In the last category, there was no mention of the specific problem, such as attention-deficit/hyperactivity disorder (ADHD) or bipolarism.

Table 1 organizes reported prevalence rates of these childhood diseases by birth years of PSID respondents. Because the most recent group in the table was born in 1986, the data do not address rates of disability among younger groups of children who have not yet reached their adult years, which for our purpose we define as beginning at age twenty-five. These data offer a valuable and consistent picture of the consequences of poor childhood health in older individuals, where these pathways can be traced.

Table 1. Percentage of People in Each Birth Group with a Childhood Illness

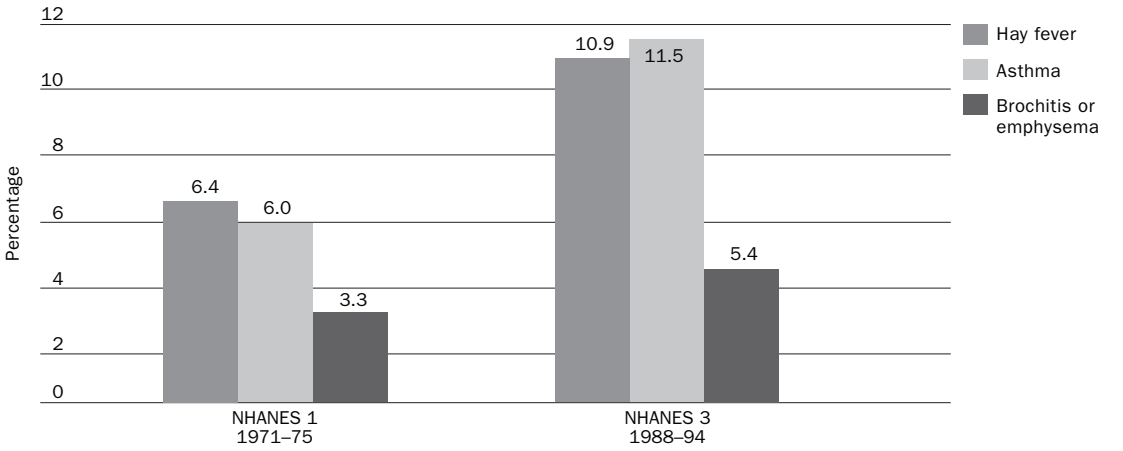
	1986–77	1976–67	1966–57	1956–47	1946–37	<1936
Measles	7.6	15.5	49.8	81.8	85.2	86.7
Vaccine 1963 ↓						
Mumps	4.3	12.7	43.4	68.1	67.3	68.6
Chicken pox	83.0	79.1	75.9	83.0	79.6	72.3
Vaccine 1995 ↓						
Asthma	12.9	9.0	5.5	5.6	4.1	2.8
Respiratory illness	14.3	12.6	9.5	10.8	7.2	7.2
Speech impediment	3.3	2.4	2.7	2.6	1.6	1.0
Allergies	12.3	11.6	8.9	9.4	6.9	5.0
Heart trouble	1.8	1.7	1.6	1.3	2.8	1.0
Ear problem	8.6	7.8	5.4	6.2	7.9	7.2
Headaches or migraines	11.9	9.0	6.6	6.7	5.5	5.8
Stomach problem	5.5	4.0	3.7	3.4	2.8	2.6
Depression	7.3	4.6	3.1	3.0	1.2	1.0
Diabetes	0.8	0.5	0.1	0.2	0.2	0.2
Epilepsy or seizures	1.2	1.2	1.3	0.6	0.5	0.0
Hypertension	1.1	0.4	0.3	0.1	0.4	0.9
Number	1,813	1,531	1,715	1,375	553	557

Source: James P. Smith, "Re-constructing Childhood Health Histories," *Demography* 46, no. 2 (2009): 387–403.

These data show several interesting patterns. First, when effective vaccines were developed, common childhood infectious diseases almost disappeared—first measles and mumps, and more recently chicken pox, for which a vaccine was developed in 1995.[13] Second, it is difficult to read conclusive evidence on the direction of secular trends with regard to rarer childhood diseases—type 1 diabetes, hypertension, and epilepsy or seizures—although there may be an increase in the most recent birth years. Third, table 1 suggests that several common childhood diseases are becoming more prevalent. This is especially the case for respiratory diseases (asthma and respiratory illness), allergies, and depression.

There are reasons why the data in table 1 should not be taken at face value. Because the data are based on recall, memory biases may play a role. Memory typically declines with time, although salient events may suffer less from this memory decay, and memories of childhood have been shown to be superior to memories of other times of life.[14] A second problem is the difficulty of separating true prevalence and incidence from improved detection. For most childhood diseases, diagnosis and detection have improved over time. For some diseases, including mental illness, there may also be lower thresholds for diagnosis, reflecting both medical advances and changing social attitudes. Finally, at very old ages, mortality selection effects, whereby the least healthy die at earlier ages, may be operative because those with childhood diseases may have lower life expectancies. However, selective old age mortality is not likely to explain the increasing trends among children born in the most recent birth years. Declines in infant mortality could lead to an alternative form of selection bias if unhealthy infants become increasingly likely to survive over time.

Figure 2. Prevalence Rates of Selected Childhood Diseases among 12–17-Year-Olds



Source: James P. Smith, "Re-constructing Childhood Health Histories," *Demography* 46, no. 2 (2009): 387–403.

How serious are these sources of bias? The second form of mortality selection—healthier babies surviving to older ages—cannot be playing much of a role in the rise in childhood chronic illness or childhood disability, given the low rates of infant mortality evidenced in figure 1 for people who are now less than sixty years old. For younger age groups, trends in childhood chronic disease still appear to be growing over time.

One way of assessing how important recall bias could be is to use contemporaneously reported data on childhood chronic conditions. Even then, one difficulty is that statistics on American health, unlike those related to the U.S. economy for instance, do not generally reflect consistent, comparable reporting over time. Data on health conditions over time come from two long-running U.S. health surveys, the National Health and Nutrition Examination Survey (NHANES) and the National Health Interview Survey (NHIS), and both periodically have changed definitions of what is included within a disease category.[15] Using subsets of childhood diseases that can be defined more or less consistently over time, figure 2 examines trends in reported rates of asthma, bronchitis, and hay fever. Similar to trends from recall data, all three childhood chronic diseases exhibit sharply rising secular trends. The similarity between the contemporaneous record and the PSID recall data indicates that recall bias is unlikely to be the primary driver of the secular trends in table 1.

Other studies using contemporaneously reported statistics also show increased rates of chronic illnesses among Americans. James Perrin and others documented substantial increases in childhood chronic illnesses such as obesity, asthma, and ADHD in the United States.[16] Jeanne Van Cleave and others, using data from three National Longitudinal Survey of Youth groups aged two to eight, reported that the prevalence of any chronic health condition was 12.8 percent for a group in 1988 that was followed to 1994, 25.1 percent for a group in 1994 followed to 2000, and 26.6 percent for a group in 2000 followed to 2006.[17] Using data from the Centers

for Disease Control and Prevention, Lara Akinbami and others showed an increase in the prevalence of childhood asthma from approximately 3.6 percent in 1980 to about 9.7 percent in 2007.[18] Some 14 percent were reported as either currently having or having once been diagnosed with asthma during their lifetimes, based on the 2009 National Health Interview Survey.

Rising rates of chronic diseases among children present a puzzle in light of rapidly declining infant mortality rates. And because many indicators of adult health have been improving over this period, questions arise about the extent to which childhood health contributes to adult health, and more basically the extent to which chronic childhood conditions are actually increasing.

Some of the major factors thought to contribute to better childhood health have been improving rather than worsening. Table 2 focuses on some determinants of child health and shows that the proportion of children who grew up in a home where neither parent smoked has been rising and that the proportion of PSID respondents who thought that they grew up in a poor family, as they self-defined what poverty meant, has been declining over time. While this may seem surprising in light of today's headlines about rising levels of child poverty, the period when these PSID adults were children was a time of significant declines in U.S. poverty, including among children. Although older mothers (those age thirty-five or older) are a risk factor for poor childhood health, once again we see declining trends in table 2. Many environmental problems (like air pollution) related to children's health are being corrected, although it is possible that new environmental toxins are being introduced.

While childhood obesity rates have risen rapidly in recent years, figure 3 demonstrates that most of that rise in childhood obesity affected the youngest age groups in table 1 and hence cannot be responsible for the table 1 trends. Figure 4 indicates that there has been only a small rise in low-birth-weight babies over time.

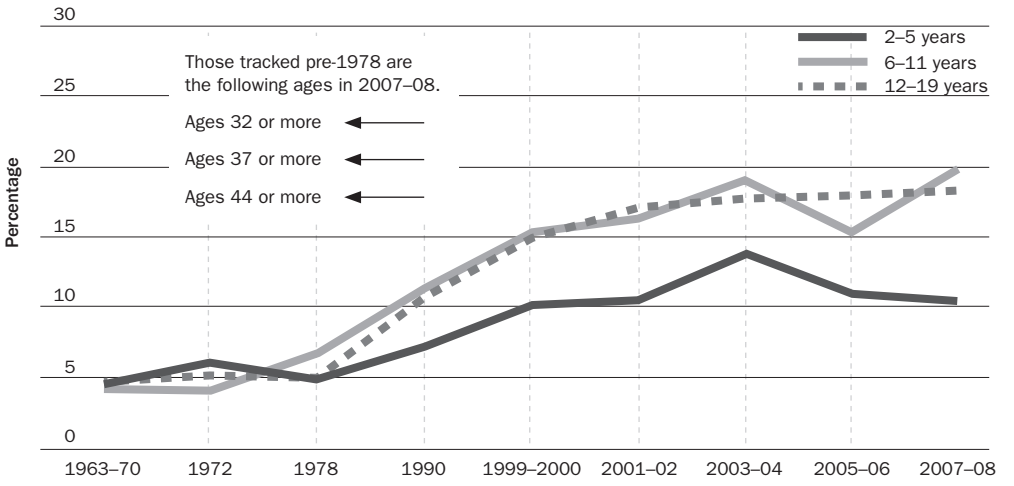
Although there is almost universal agreement that reported rates of childhood chronic conditions are rising, we believe that any conclusion about rapidly rising rates of childhood chronic physical health conditions over time are premature at best, especially concerning the magnitude of trends. More

Table 2. Percentage of People in Each Birth Group by Selected Childhood Family Characteristics

	Year of birth					
	1986–77	**1976–67**	**1966–57**	**1956–47**	**1946–37**	**<1936**
Percentage of people where neither parent smoked when respondent was <17	51.3	41.1	39.2	34.9	32.3	43.0
Percentage of people where parents were poor when child	26.9	31.4	34.8	41.7	49.9	55.9
Percentage of children raised in a home with both parents	59.5	66.2	70.4	76.4	79.7	75.4
Percentage of children born to a mother 35 years old or older	5.5	5.5	10.3	10.9	12.6	NA

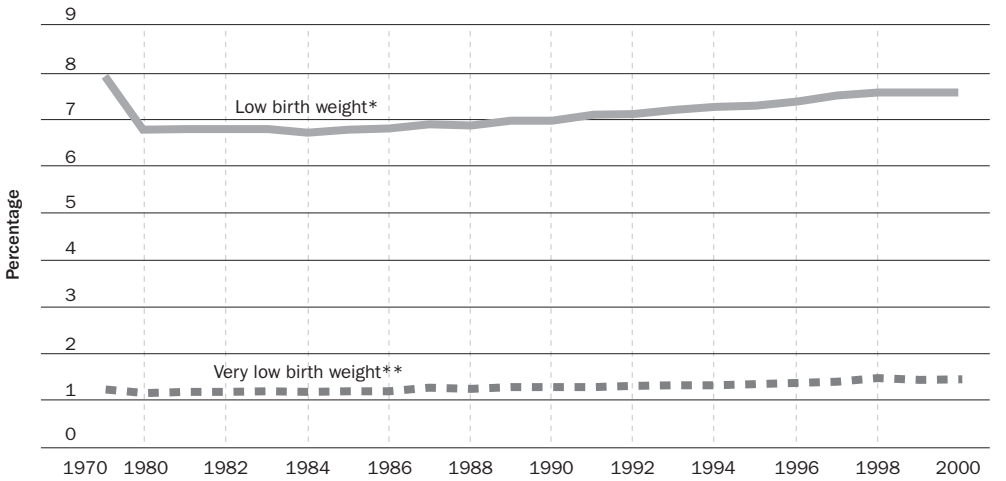
Sources: Data on children born to a mother age thirty-five or older are from NCHS-National Vital Statistics Reports. All other data from the Smith PSID module.

Figure 3. Trends in Obesity among Children and Adolescents: United States, 1963–2008



Source: Cynthia Ogden and Margaret Carroll, *Prevalence of Obesity among Children and Adolescents: United States, Trends 1963–1965 through 2007–08* (National Center for Health Statistics, June 2010) (www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.pdf).

Figure 4. Low-Birth-Weight and Very Low-Birth-Weight Rates by Year, United States, 1980–2000, All Races



Source: National Center for Health Statistics. Birth weight data based on birth certificate data.
Note: Low birth weight is less than 2,500 grams. Very low birth weight is less than 1,500 grams.

work is needed to separate out the impacts of improved detection and diagnosis. The real trends in health may be nowhere near as dramatic as suggested by simple time-series of reported prevalence rates of childhood disease. Documenting real changes in prevalence of specific diseases is a high-priority research topic.

One area of greater confidence about deteriorating trends over time concerns childhood mental health issues. As table 2 shows, one of

Table 3. Percentage of People in Each Birth Group by Childhood Illness and Family Income

		Year of birth				
		1986–77	**1976–67**	**1966–57**		**1956–47**
Measles		4.6	9.7	45.9	Vaccine 1963 ↓	85.6
		11.6	**18.7**	**52.8**		**79.7**
Mumps		2.2	7.4	42.9	Vaccine 1963 ↓	76.9
		8.1	**15.5**	**48.2**		**66.2**
Chicken pox	Vaccine 1995 ↓	91.1	86.2	82.2		90.9
		78.1	**74.8**	**72.8**		**80.3**
Asthma		10.8	7.8	6.0		4.5
		14.5	**10.4**	**5.7**		**6.4**
Respiratory illness		16.4	14.2	11.6		12.4
		11.5	**11.4**	**7.7**		**11.5**
Speech impediment		4.0	2.7	3.8		1.7
		4.4	**2.0**	**2.6**		**1.9**
Allergies		15.1	14.9	10.9		9.6
		9.7	**10.2**	**7.7**		**7.1**
Heart trouble		1.4	1.1	1.5		0.6
		3.0	**1.9**	**1.4**		**1.9**
Ear problem		10.2	8.9	6.8		7.3
		7.7	**7.5**	**4.9**		**7.7**
Headaches or migraines		10.8	8.9	5.5		6.8
		12.1	**8.7**	**7.3**		**9.0**
Stomach problem		5.7	3.1	3.2		1.7
		6.2	**4.4**	**3.8**		**4.5**
Depression		6.7	3.8	2.7		3.4
		9.8	**5.4**	**3.3**		**4.5**
Diabetes		0.8	0.4	0.3		0.0
		1.5	**0.7**	**0.0**		**0.0**
Epilepsy or seizures		1.1	0.6	0.9		0.6
		1.2	**2.4**	**1.4**		**1.2**
Hypertension		0.3	0.2	0.5		0.0
		1.8	**0.9**	**0.2**		**0.0**
Number		1,813	1,531	1,715		1,375

Source: Smith PSID module.
Note: The top number represents percentage with a childhood illness in each group above median family income; the bottom number (in bold) represents percentage below median family income.

the drivers of depression in childhood—being raised in the absence of both parents—has been worsening over time.[19] Similarly, in a careful study, Marissa King and Peter Bearman showed that changing diagnosis alone does not explain the increasing rates of childhood autism, even though up to half of the reported increase might be due to changes in reporting and definitions.[20] The PSID childhood retrospective module can also display trends based on family income.

Table 3 documents trends for children who lived in households with family incomes above and below the median. Historically, the reported prevalence of the three childhood infectious diseases was greater among better-off American families, as was the effectiveness of vaccines for measles and mumps, reflecting the greater availability of vaccinations to the above-median income group. The pattern of rising prevalence of childhood disease is true both above and

below the median income, but with few exceptions (respiratory illnesses, allergies, ear problems) in the most recent birth groups, prevalence rates are higher for children who grew up in below-median income families. Increases in reported rates of diabetes and hypertension in the below-median income group are especially striking. Our findings are consistent with a large body of research showing that children from low-income families experience higher prevalence rates for the main childhood health problems.

Prevalence rates also vary by race. For example, Akinbami and others, using one measure of social-economic differences, racial differences in asthma prevalence, show Asian American children having lower prevalence than whites, black children having 1.6 times the prevalence rate of whites, and Puerto Rican children having 2.4 times the prevalence rate of whites.[21] For more on socioeconomic disparities, see the article in this volume by Neal Halfon and others.[22]

Long-Term Economic Consequences of Childhood Health Problems

Recent studies have examined the role of environmental shocks such as famines and toxins in affecting early childhood and gestational environments and subsequently influencing the path of development and adult health. A large body of work, reviewed by Tessa Roseboom and others,[23] examined the effects of growing up during the 1944 Dutch famine on later patterns of heart disease; Douglas Almond and others used a 1 percent sample of China's 2000 census and found a range of adverse economic effects on Chinese exposed to the famine of 1958–61.[24]

The main advantage of these approaches, as argued by their proponents, is that they provide an opportunity to isolate causal effects of early-life conditions. However, the extent to which the shocks that were examined can be seen as representative of other types of shocks to childhood health remains unknown (see Angus Deaton[25]). It is important to examine the extent to which shocks generate unintended selection effects, such as differential fertility or mortality, that change the measured average health of surviving babies. However, given the rapid decline of infant mortality in America, and the currently low levels, selection effects due to unhealthy children dying in early childhood are less of an issue.

One common technique scientists use to disentangle cause and effect is to observe "natural experiments," that is, specific changes taking place in nature, and then study the impact of these changes on other aspects of life. Recent natural experiments on the impacts of early-life conditions stem from Robert Barker's hypothesis that foundations for chronic illness in later life are laid in the uterus. Barker argued that stress to the fetus during pregnancy leads to the diversion of resources to protect the brain at the expense of other organs, weakening these organs and predisposing the fetus to later patterns of disease.[26] In line with this, several studies found that birth weight (often used as a proxy for the uterine environment) was a predictor of health in later life.[27]

Caleb Finch and Eileen Crimmins argued in a 2004 article that much of the improvement in adult health over the centuries came about because of reduced exposure to early-life stresses.[28] They provided evidence that declining infant mortality in Sweden predicted mortality declines among adults in the same group. They suggested that lower risk of gastroenteritis among infants might lead to lower risk of inflammation in later life.

Population studies have also examined whether early physical health adversity affects economic circumstances later on. This research follows individuals from childhood to adulthood or supplements existing studies that do follow individuals over time with data that are missing from those studies. The two mainstays of this research are British studies following individuals from the week of their birth, and long-term American studies.

Using the data from the PSID, Smith found that childhood health bears on a range of adult economic variables including levels and trajectories of family income, household wealth, individual earnings, and volume of work that are robust to controlling for personal attributes that are observed in the data and those that are unobserved.[29] Anne Case, Darren Lubotsky, and Christina Paxson found that respondents to the United Kingdom National Child Development Study (NCDS) who had low birth weight and poor childhood health experienced later problems that included lower school and occupational attainment. In another paper, Case and Paxson indicated that childhood health (proxied by height) is associated with many positive life outcomes, only some of which are related to education.

One weakness in examining the effects of childhood illnesses on later health and economic status in America is the lack of data that track people from early life through adulthood. Individual life histories have become a useful tool in examining the effects of early conditions on adult health in panel studies, which follow the same respondents over time.[30] Life histories ask respondents to recall important information about their early lives, including general childhood health, health care utilization, and onset and duration of childhood illnesses. Visual and verbal memory cues prompt respondents to remember this information.

Several major studies have employed life-reconstruction data, including the Health and Retirement Study (HRS), the English Longitudinal Study of Ageing, and the Survey of Health, Aging, and Retirement in Europe. (See the data appendix to this volume for additional information about these data sets.) This technique enables researchers to extract relevant information from recent large-scale panel studies that did not interview respondents as children. Using data from HRS and PSID, Smith found that patterns of recalled childhood illnesses closely matched information about illness during respondents' childhoods as measured in the contemporaneously collected American national health surveys, such as NHANES and NHIS.[31] The recalled measures of childhood illness act as important predictors of later patterns of illness using these samples.[32] On the physical health side, Katayoun Bahadori and others reviewed sixty-eight studies and found evidence pointing to associations between asthma, poorer schooling outcomes, and lower future earnings.[33]

Lifetime Effects of Childhood Mental Illness

Given the increasing prevalence of mental health problems among young children, the role of childhood mental illness is increasingly important. Janet Currie and others found significant effects of childhood mental health problems.[34] They used data based on public health insurance records of 50,000 children born between 1979 and 1987 in Manitoba, Canada. Their design allowed them to compare siblings with noncongenital health problems. They reported that, although childhood *physical* health problems often lead to future health problems, childhood *mental*

Table 4. Estimated Effects of Childhood Health on Adult Health Reported as Excellent or Very Good (Percentage Point Change)

	Across-individual model		Across-sibling model	
Variables	**1**	**2**	**3**	**4**
Childhood diseases				
Mental health	–12.1***	–14.9***	–10.3***	–9.3**
Physical health	–2.1	X	–9.1***	X
Infectious		4.2***		0.7
Sight problems		–11.0***		–12.0**
Asthma		–6.5***		–8.1**
Diabetes + heart		–17.0***		–10.4
Respiratory + allergies		–2.5*		–1.2
+ ear + stomach		–2.4		–1.2
Speech problems		–0.7		–2.0
Epilepsy		–2.4		–1.3
Headaches		–6.0***		–8.7**
Hypertension		–27.6***		–25.3

Source: Authors' calculations.
Note: Mental health percentages in columns 1 and 3 control for physical health conditions generally; mental health percentages in columns 2 and 4 control for the specific physical health conditions listed in the table. Models also include age controls. Physical health does not include the common childhood infectious diseases.
***Statistically significant at 1 percent level; **statistically significant at 5 percent level; *statistically significant at 10 percent level.

health problems produce significant effects that are not dependent on future physical health problems.

James Smith and Gillian Smith used the retrospective PSID health data to uncover substantial effects of recalled childhood depression on future economic well-being.[35] Their estimations showed substantial reductions in income largely caused by a reduction in weeks worked per year. Respondents who reported childhood mental problems also had lower educational attainment, although this effect was small relative to the impact on income. The authors estimated that the family of each affected individual lost about $300,000 over a lifetime, on a discounted net value basis. The corresponding cost to the current American population would be $2.1 trillion. Note that this cost is larger than the annual costs calculated by Mark Stabile and Sara Allin in this volume, in part because it reflects the present discounted value of costs that would be accrued over a lifetime.

Currie and Stabile used Canadian data to examine the long-term effects of ADHD, a common form of mental illness among young children. Controlling for confounding factors, they found that the effects of ADHD are much greater than those of physical health problems.[36] They reported reductions in future reading and mathematics test scores and increased probability of future grade repetition.

A New Look at the Effects of Childhood Health

Using the retrospective PSID childhood health module, we present new estimates of the impacts of being in excellent or very good health as a child on the economic and health

aspects of later life as an adult. Our analyses examine the association of both dimensions of childhood health—physical and mental—with salient aspects of adult life: health, education, work, and income.

In the first column of table 4, we summarize the impacts of having any one of the childhood physical health problems (with the exception of measles, mumps, and chicken pox) and the effect of having any childhood mental health problem on whether a person's self-reported adult health in 2007 was excellent or very good. In the second column of table 4, childhood physical health is separated into its component parts, although some subcomponents are aggregated either because of low prevalence or because of the commonality of the size of the effects of the childhood health problem on adult life. The asterisks in tables 4–6 indicate the likelihood that the effect is statistically different from zero (or no effect), with three asterisks indicating one in a hundred, two asterisks indicating one in twenty, and one asterisk indicating a one in ten chance that there is really no effect.

The two models on the left side of the table are estimated using ordinary least squares (OLS), the most widely used statistical way of showing the relationship of one variable to another, conditional on other variables. All the variation used in the OLS model to estimate an average effect represents variation *across people* who were originally children in the PSID. In contrast, the two models on the right side of table 4 focus on comparing siblings within the same families (often called sibling models). All of the variation used in sibling models represents differences *across siblings* in the same family. The sibling models are preferred because they account for all of the common background characteristics shared by siblings (their family, neighborhoods, and schools) whether or not they can be measured in our models. All full age-range models include controls for being in age groups twenty-one through forty and forty-one through sixty; the over-sixty age group is excluded.

The models in table 4 show the association between childhood physical and mental health problems on the probability of being in either excellent or very good health as an adult. These indicate that childhood *mental* health problems have larger impacts on self-reported adult health than do childhood *physical* health problems, although the two sets of estimates are close in the sibling models. Using the sibling models, this implies that individuals who had a mental health problem as a child or those who had a physical health problem as a child are 10 percentage points less likely to be in excellent or very good health as an adult.

When the childhood physical health problems are separated into the specific childhood physical health problems, the negative effects on adult health are somewhat larger for hypertension, sight problems, asthma, epilepsy, and diabetes. For some childhood physical health problems, there are strong selection effects whereby children in better-off families are more likely to get a particular disease. A good illustration involves the common infectious diseases, where the across-person estimate is statistically significant and positive. In contrast, the across-sibling estimate is small and statistically insignificant. Table 3 suggests that children in better-off families are more susceptible to these common infectious diseases. This selection effect explains why the estimated effect of having these infectious diseases as a child is positively associated with better health

Table 5. Estimated Effects of Poor Childhood Health on Adult Socioeconomic Status (Percentage Point Change)

Socioeconomic indicator	Across-individual model	Across-sibling model
Number of years of adult education		
Mental health	–0.775***	–0.446***
Physical health	0.294***	0.108
Number of weeks worked in a year as an adult		
Mental health	–6.14***	–7.06***
Physical health	–2.25***	–2.20***
Percentage change in earnings†		
Mental health	–37.6***	–47.6***
Physical health	–1.8	–6.2
Percentage change in family income		
Mental health	–33.0***	–36.5***
Physical health	2.1	–12.6**

Source: Authors' calculations.
Note: Models also include age controls. Physical health does not include common childhood infectious diseases.
† Estimated over sample of workers only.
***Statistically significant at 1 percent level; **statistically significant at 5 percent level; *statistically significant at 10 percent level.
Percentage changes are from log models and the coefficient is multiplied by 100.

as an adult in the across-person models. This example suggests that some caution is in order when interpreting across-person estimates in various studies in the literature.

Table 5 lists our estimates of the average effects of mental and physical childhood health problems (without the childhood infectious diseases) for adult socioeconomic status, including years of schooling, the number of weeks worked in a year, percentage change in earnings, and percentage change in family income. For the number of years of schooling—the most common adult socioeconomic factor examined in the literature—the across-person estimates suggest that the damage done on adult life is much larger for mental health problems (a loss of 0.8 of a year of schooling) than for physical health problems (where the estimated effect is actually positive). In the preferred across-sibling models, the impact of childhood mental health problems remains statistically significant—a reduction of about a half-year in schooling—but the impact of childhood physical health problems is insignificant. Mental health problems as a child appear to be much more important than physical health problems during childhood on limiting educational opportunities.

For the number of weeks worked in a year, we find the same relationship: childhood mental health problems are much more important than childhood physical health problems. In fact, the impacts of childhood mental illness are about three times greater on the number of weeks worked than those for childhood physical illnesses. The preferred across-sibling model indicates almost seven fewer weeks worked yearly by those who had childhood mental health problems. When we examine the percentage change in adult labor market earnings, estimated impacts again are much larger and more statistically significant for childhood

Table 6. Estimated Effects of Childhood Health on Adult Outcomes by Age Group, Using Across-Sibling Models (Percentage Point Change)

Outcomes	Age 21–40	Age 41–60
Adult health is excellent or very good (percentage points)		
Mental health	–13.5***	–4.7
Physical health	–8.1***	–10.8***
Number of years of education as adult		
Mental health	–0.486***	–0.288
Physical health	0.127	0.043
Number of weeks worked in a year as an adult		
Mental health	–8.39***	–4.54
Physical health	–1.87*	–2.64**
Percentage change in earnings		
Mental health	–53.0***	–25.9
Physical health	–5.4	–8.6
Percentage change in family income		
Mental health	–39.8***	–25.7
Physical health	–10.4	–14.5*

Source: Authors' calculation.
***Statistically significant at 1 percent level; **statistically significant at 5 percent level; *statistically significant at 10 percent level.
Percentage changes are from log models and the coefficient is multiplied by 100.

mental health problems than for childhood physical health problems.

Our preferred and most general economic outcome is the percentage change in family income. Using across-sibling models, the estimate for children's mental health problems suggests a 37 percent lower family income—a decline that is three times greater than the estimated impact for a childhood physical health problem.

All of these adult socioeconomic models point to the same conclusion: childhood mental health problems have much larger effects on later adult life than childhood physical health problems.

An important issue not addressed by table 5 concerns how these effects of childhood health problems vary by age. Using the preferred across-sibling models, table 6 provides separate estimates for two age groups, twenty-one through forty and forty-one through sixty.

These estimates across age groups for a single calendar year (2007) could be interpreted either as effects associated with an individual becoming older (aging effects) or as effects associated with individuals being born in different calendar years (birth-cohort effects). There is no way to identify separate birth-cohort or aging effects with data in a single calendar year because an older person must necessarily have been born in an earlier calendar year. But physical improvements in workplace disability accommodations over time may have made physical health problems less limiting over time, especially for younger persons. The extent of accommodation may be much smaller for mental health problems. In fact, the impact of childhood mental health may have increased over time as the U.S. economy increasingly values

mental and academic skills over physical skills. Whichever interpretation is preferred, estimates for these socioeconomic outcomes indicate that the effects of childhood mental problems are somewhat smaller in the older age group for all such outcomes, while the childhood physical health outcomes become slightly larger in the older age adult group.[37]

Effect of Interventions in Influencing Lifelong Health: A Focus on Mental Health

Given the prevalence and large long-run effects of childhood mental health conditions such as ADHD and childhood depression, the importance of remediation is readily apparent (see the article in this volume by Mark Stabile and Sara Allin for a more complete treatment of ADHD[38]). Effective interventions could potentially offset not only the psychological and economic costs experienced by children and their families when children are young but also reduce high costs associated with lifelong psychological problems. Recent studies examining the lives of individuals who have experienced childhood psychological problems indicate lifetime costs in terms of earnings alone that could exceed $500,000.[39] Such assessments underestimate total effects because they do not include many costs that spill over to family members, such as treatment costs and mental distress of the family. Many studies have examined the most effective pharmacological, behavioral, and psychological treatments for each of these problems.

Attention-Deficit/Hyperactivity Disorder, or ADHD

ADHD is the most common childhood mental health condition. Treatment for ADHD generally takes the form of pharmacological or behavioral interventions. Several studies have examined effects of stimulant and nonstimulant medication either solely or in combination with other forms of treatment.[40] These studies have documented the efficacy of stimulant medications for treatment of ADHD.[41] Studies continue to look into the optimal combination of pharmacological and behavioral interventions, and the effectiveness of different types of behavioral interventions and pharmacological treatments.

One of the largest recent examinations of the effectiveness of treatments for ADHD is the National Institute of Mental Health's multimodal study. Researchers studied four groups of children: those who were treated with intensive medication management alone, those who were treated with intensive behavioral treatment alone, those who received a combination of both, and a control group of children who received the care that was routinely available in the community. The fourteen-month follow-up of more than 600 children revealed that both medication and combined conditions were superior to community care.[42] Effects, while diminished, were also apparent in a follow-up ten months later.[43]

While the literature provides strong evidence that appropriately applied stimulant treatment, perhaps in combination with behavioral interventions, can alleviate at least some symptoms of ADHD, there is no way yet of knowing whether these treatments break the link between childhood ADHD onset and the potential adverse effects over the long term. This gap in our knowledge is due largely to the fact that most studies have not followed children treated for ADHD over long periods of time.

Childhood Depression

Childhood depression is another of the more common childhood mental health conditions. For childhood depression, studies

have evaluated the effectiveness of various pharmacological, behavioral, and psychological interventions. For the latter two, the use of cognitive behavioral therapy, or CBT (an approach that focuses on patients' understanding of their patterns of thoughts and beliefs and the behaviors that flow from those thoughts), has been widely studied. In general, this literature has suggested that CBT is effective in treating both anxiety and depression. A 2005 Cochrane Literature review, authored by John Cochrane, of CBT treatment for anxiety in children found a 50 percent success rate, higher than in control cases.[44] Several experiments and reviews found that CBT is effective in treating child and adolescent depression.[45]

For pharmacological interventions, several studies examined the use of selective serotonin reuptake inhibitors (SSRIs, commonly prescribed antidepressants) to treat childhood depression. Uncertainty remains about the efficacy of SSRIs in treating childhood depression. Almost all reviews stress the incompleteness of the evidence in terms of drawing conclusions on efficacy. The Cochrane review by S. E. Hetrick and others reviewed twelve trials examining the use of SSRIs in children and concluded that there was little evidence for effectiveness.[46] However, several papers and reviews demonstrated the effectiveness of the SSRI fluoxetine for treatment of childhood depression.[47] Although fluoxetine, sold as Prozac and under other brand names, is currently FDA-approved for children, unlike some other SSRI medications, debate continues about the potential for increased risk of suicide attempts.[48]

There is much still to learn about optimal combination of treatments in terms of promoting child mental health. Reviewers are almost unanimous in believing that the existing body of evidence, based largely on short-term and small-scale trials, does not support efforts to draw substantive conclusions regarding overall efficacy. Given evidence on the lifelong effects of childhood psychological problems and the growing number of trials that have tested the efficacy of different treatments, longer-term follow-up studies are needed to examine the effectiveness of these treatments in breaking the link between childhood psychological problems and negative consequences in adulthood. Complex issues also surround how results from clinical trials might be scaled up to the broader population. While CBT has been demonstrated to be effective in treating childhood depression in many trials, the task of rolling out this and other effective treatments to wider and more heterogeneous populations is obviously more difficult than demonstrating effectiveness in single trials.

Conclusions

While the raw data show sharp increases in the prevalence of most childhood physical health problems over time, such data are also consistent with improved detection of childhood disease, especially since many causes of childhood disease have not become worse over time. Conclusions about rapidly rising rates of childhood physical health problems over time are premature at best, especially concerning the magnitude of trends. Documenting real changes in the prevalence of specific diseases is a high-priority research topic. In contrast, the evidence that childhood mental health problems are becoming worse over time is much stronger.

We find that both childhood physical and mental health problems result in poorer adult health. However, childhood mental health problems have much larger impacts than do childhood physical health problems on four

critical areas of socioeconomic status as an adult: education, weeks worked in a year, individual earnings, and family income. For example, mental health problems in childhood are associated with a 37 percent decline in family income, three times greater than the decline related to having physical health problems.

Finally, we examine evidence on the efficacy of early mental health treatment for children in terms of promoting good health later on. Existing studies suggest that a combination of the use of cognitive behavioral therapy and medication appears to be effective in the treatment of both anxiety and depression in children. However, much more research is needed on the long-run efficacy of these childhood interventions. Clinical trials have been too short to evaluate the long-term impacts of medication, and the impacts are definitively long term.

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