Chipping Away At Health: More On The Relationship Between Income And Child Health

Cutbacks in health services for poor children must be reversed, because of the documented link between income and child health.

by Janet Currie and Wanchuan Lin

ABSTRACT: Low-income children are in worse health than other children are. This paper explores the extent to which insults to health and activity limitations are responsible. In the most recent National Health Interview Survey (NHIS) data, low-income children are more likely than other children to have virtually every measured chronic or acute condition and are more likely to be limited by these conditions. Mental health conditions are particularly common and limiting. But the higher incidence of measured conditions and limits does not explain all of the relationships between income and overall health status, which suggests that unmeasured illnesses and injuries are also involved. [*Health Affairs* 26, no. 2 (2007): xxx–yyy; 10.1377/hlthaff.26.2.xxx]

Wealthier people are healthier than others. This relationship is apparent at birth in key indicators such as birthweight.[1] Recent research has shown that the relationship between poverty and child health holds not only in the United States but also in countries such as Canada and the United Kingdom that have universal health insurance. If we thought that lack of health insurance coverage was the only reason for the gap in health status between rich and poor U.S. children, then presumably we would not expect to see a gap in Canada and the United Kingdom.[2]

Given that 17 percent of all U.S. children under age eighteen live in poor families, we need a better understanding of why poverty is linked to ill health.[3] Many researchers have documented the fact that poor children suffer more insults to their health than richer ones do. For example, Paul Newacheck, Neal Halfon, and Anne Case and colleagues all show that poor children are more likely than others to have many chronic conditions.[4]

This paper investigates the relationships between poverty, overall health status, health insults, and activity limitations resulting from health problems, using data

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DOI 10.1377/hlthaff.26.2.1

from the 2001–2005 National Health Interview Surveys (NHIS). We contribute to the existing literature in several ways. First, we examine a more recent time period. Second, and more importantly, we broaden the scope of the investigation to include mental health conditions, acute illnesses, and injuries, to the extent that this is possible using NHIS data. Third, we ask whether controlling for the specific health conditions and limitations measured in the NHIS reduces the effect of poverty in regressions in which the dependent variable is the mother's assessment of the child's health status.

Study Data And Methods

■ **NHIS child health measures.** We focus on the child health measures available in the 2001–2005 waves of the NHIS, a nationally representative survey of about 100,000 people per year.[5] For comparison with previous work, we also report some results using data from earlier waves of the NHIS. The NHIS randomly selects one child in each household for an in-depth survey. In what follows, we focus primarily on these children. In drawing our sample, we followed the methods of Case and colleagues.[6] As did they, we excluded children who head their own households, who are not children of the reference person and members of the primary family, and who are not of the same race as other children in the household. We also excluded a relatively small number of children with missing data on health outcomes (overall health status, birthweight, school days missed because of illness, and answers to the "Strengths and Difficulties" questionnaire described further below), as well as children for whom information about race was missing. If the mother or father was present in the household but information about the parent's age, education, or employment status was missing, we also excluded those observations. We used Case and colleagues' age categories except that we excluded children under age two because mental health measures were not available for children of those ages.

Case and colleagues excluded from their analysis children for whom income data were missing. We departed from this procedure by using NHIS income imputations. From 1997 to 2005, the NHIS imputes income five times. We used these data and methods appropriate for the analysis of multiple imputed data. For data prior to 1997, we imputed income five times, using methods similar to those used in the later years by the NHIS. We then used the imputed income measures to impute poverty status.

■ **Focus on mental health conditions.** Parents were asked about specific mental health conditions and about limitations attributable to those conditions. Our overall measure of whether a child has a mental health condition was constructed by pooling answers to questions about whether parents have ever been told that a child has a learning disability, developmental delay, mental retardation, Down syndrome, or autism. We also broke out attention deficit hyperactivity disorder (ADHD), the most prevalent mental health condition, separately. This focus represents an innovation in our analysis.

■ **"Strengths and Difficulties" questionnaire.** The NHIS includes questions for children ages 4–17 from the "Strength and Difficulties" questionnaire in its recent surveys. Like the other questions, these are answered by the mother but involve specific child attributes and behavior. Similar questions often appear on screeners used as a first step in diagnosing childhood mental health conditions.

The five "Strengths and Difficulties" questions that were consistently asked over our sample period referred to whether the child never, sometimes, or frequently has many worries; is unhappy; gets along better with adults than with other children; is obedient; or has a good attention span. Each question is coded 0, 1, or 2, where a higher number corresponds to a worse outcome. The highest score is 10, although the median child scores a 1 on this scale. A similar scale is available for two-to-three-year-olds.

■ **Analysis.** We first focused on a comparison of the mean health outcomes of poor and nonpoor children, highlighting differences in both prevalence and the extent to which children are limited by their health conditions.

We next estimated linear probability models for the probability that a child is in excellent or very good health, where poverty status is one of the independent variables. Other independent variables include log family size, child's sex, and indicators for whether the child was white (0/1) or black (0/1); dummies for each year of a child's age; dummies for each year and region; whether the mother (or father) was present in the household; whether the mother (or father) was a high school dropout or graduate or had some college (the omitted category being completed college), interacted with whether the mother (or father) was present in the household; the mother's (or father's) age, interacted with whether the mother (or father) was present in the household; and whether the mother (or father) was unemployed, interacted with whether the mother (or father) was present in the household. These control variables correspond to those selected by Case and colleagues. These models were estimated by child age group; they allowed us to see whether the relationship between income, child age, and overall health status has changed over time.

Next, we included the specific health measures in models of overall health status. This analysis allows readers to see for themselves which health measures are associated with better assessments of overall health. Finally, we included interactions of poverty with the specific health measures. These models allowed us to ask whether specific health conditions have larger effects on the overall health status of poor children. All of our results were weighted using the NHIS sample weights.

Study Results

■ **Health of poor versus nonpoor children.** Between 2001 and 2005, approximately 8.3 million children (18.8 percent) were estimated to be poor. Overall, only 70 percent of poor children were reported by their mothers to be in excellent or very good health, compared with 86.9 percent of higher-income children (Exhibit 1). The

EXHIBIT 1
Health Of Poor Children Versus Nonpoor Children, 2001–2005

	Poor	Nonpoor
Maternal assessment of child health		
Health is excellent/very good	70.0%	86.9%
Ages 2–3	74.6	90.1
Ages 4–8	72.5	87.3
Ages 9–12	68.2	87.0
Ages 13–17	66.1	85.3
Health at birth		
Birthweight (grams)	3,221	3,348
Birthweight <2,500 grams	11.2%	7.8%
Birthweight <1,500 grams	2.7	2.1
Chronic condition		
Ever told asthma	15.9%	13.1%
Ever told mental problem[a]	11.9	7.9
Ever told ADHD, ages 2–17	7.1	6.0
Trouble hearing or seeing	7.6	5.3
Stuttering or stammering, past 12 months	2.6	1.2
Ever told heart problems	1.8	1.4
Ever told diabetes	0.2	0.2
Ever told arthritis	0.2	0.1
Any of the above	32.4	26.5
Ages 2–3	23.1	13.8
Ages 4–8	29.4	23.4
Ages 9–12	36.1	29.6
Ages 13–17	37.5	31.9
Activity limitations		
Any activity limit	11.6%	7.3%
Limit because of chronic condition	11.4	7.0
Ages 2–3	6.1	3.7
Ages 4–8	9.7	6.2
Ages 9–12	13.9	8.7
Ages 13–17	14.1	7.8
Asthma/respiratory problem causes limit	1.9	0.6
Mental problem causes limit[b]	6.2	3.5
ADHD causes limit	2.3	1.4
Hearing/vision causes limit	0.8	0.5
Speech problem causes limit	1.9	1.5
Injury causes limit	0.1	0.1
Bone/joint/muscle problem causes limit	0.4	0.2
Epilepsy causes limit	0.3	0.2
Birth defect causes limit	0.4	0.2
Overall mental health		
MHI scale score, ages 2–3	1.673	1.367
S&D questions, ages 4–17	2.230	1.694
Ages 4–8	2.017	1.537
Ages 9–12	2.319	1.703
Ages 13–17	2.403	1.836
Illness and medically attended injury		
Days missed illness/injury past 12 months	4.471	3.531
Injured/poisoned requiring medical attention last 3 months	2.4%	3.1%
Asthma attack past 12 months	7.3	5.7
ER due to asthma past 12 months	3.2	1.6
Respiratory allergy past 12 months	11.5	13.5
Frequent diarrhea past 12 months	1.8	1.2
3+ ear infections past 12 months	7.2	5.6
Number of observations	7,363	36,858
Number of observations representing	8,339,503	44,476,130

SOURCE: National Health Interview Survey (NHIS), 2001–2005 Sample Children Files, Children Ages 2–17.

NOTES: MHI is Mental Health Inventory. S&D is "Strengths and Difficulties" questionnaire.

[a] Includes learning disabilities, developmental delays, mental retardation, Down syndrome, and autism.

[b] Includes limits due to learning disabilities, developmental delays, mental retardation, and other mental problems.

gap grows from 15.5 percentage points for children ages 2–3 to 19.2 percentage points for children ages 13–17.

■ **Incidence of low birthweight.** The incidence of low birthweight (less than 2,500 grams) is higher than average in poor households (Exhibit 1). Low birthweight is an important indicator because it has been found to have important effects on future health.[7] Karen Linnet and colleagues found that premature infants have a much higher risk of ADHD, which suggests that gaps in the incidence of some specific chronic conditions might be related to gaps in health at birth.[8] In our models, we controlled directly for such intervening health factors, which is likely to attenuate the estimated effects of low birthweight in the multivariate models.

■ **Prevalence of chronic conditions.** Asthma is the leading chronic condition among children and is also known to be a leading cause of pediatric emergency department (ED) use, hospitalization, and school absence.[9] Approximately 1.3 million poor (16 percent) and 5.8 million nonpoor children (13 percent) have asthma by this measure (Exhibit 1). It might be less widely appreciated that, as Exhibit 1 shows, mental health conditions are the second most prevalent set of conditions, with ADHD being the largest single diagnosis within that category (more than three million affected children).[10] Hearing, vision, and speech problems, such as stuttering or stammering, are together the third most common category of chronic conditions. Considering all of the listed conditions together, a staggering 32.4 percent of poor children and 26.5 percent of nonpoor children have at least one of these conditions.

■ **Activity limitations.** Fortunately, many fewer children are reported to have activity limitations than have chronic conditions, but the disparities in the extent to which children are limited by their conditions are much greater than disparities in the prevalence of conditions between poor and nonpoor children. Also, most children who have activity limitations are limited by a chronic condition (Exhibit 1).

If a poor child has a chronic condition, he or she is more likely than a nonpoor child to be limited by it. For example, poor children are a modest 1.2 times more likely to have ever been told that they have asthma than other children are. But they are 3.2 times more likely to be limited by asthma. Similarly, poor children are 1.2 times more likely to have ever been told that they have ADHD but 1.6 times more likely to be limited by it.

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 the teenage years, poor children have almost double the probability of being limited by their chronic conditions (Exhibit 1). So by the teen years, 1.18 million poor children and 3.47 nonpoor children are limited by chronic conditions each year, which implies that poor children account for a quarter of all children who are so limited.

There appears to be a discrepancy between the conditions that are most prevalent and the conditions that cause the most activity limitations. Although asthma is the most prevalent condition, it is not the most prevalent limiting condition in Exhibit 1. That distinction belongs to mental health problems such as ADHD.[11]

Only 158,451 poor children are reported to be limited by asthma, compared with 517,049 who are limited by a mental health problem (of these, 2.3 percent or 191,809 poor children are limited by ADHD).[12] This comparison suggests that although there is certainly scope for improved asthma management, there might be an even greater need for improved management of mental health conditions. Accumulating evidence about the negative long-term effects of conditions such as ADHD on important child outcomes such as educational attainment strengthens these conclusions.[13] Exhibit 1 also shows that poor children consistently have worse outcomes on the "Strengths and Difficulties" index than other children have.

About 10 percent of children with hearing or vision problems are reported to be limited by those problems, although once again, the incidence is higher among poor than among nonpoor children. In contrast, many more children are limited by speech problems: 1.9 percent of poor children and 1.5 percent of other children. These numbers suggest some scope for improving the treatment of vision and hearing problems, but also a large payoff, at least in terms of reducing activity limitations, for investments that improve the treatment of speech problems.

■ **Burden of illness and injury.** NHIS data on the burden of illness and injury are relatively sparse, but Exhibit 1 summarizes what is available. Poor children (of school age) are reported to have missed more days of school as a result of illness and injury than other children.

In view of all the preceding evidence, it is striking that the number of injuries or poisonings reported to have required medical attention is small and is smaller for poor children than for other children. Since injuries are the leading cause of death among children older than one year, and injury-related deaths are much more common among poor than among high-income children, it seems unlikely that injuries are actually less frequent among poor children.[14] Hence, these numbers suggest that responses to this question are strongly influenced by parents' judgments about whether injuries merit medical attention.

Many children suffer from asthma attacks, and 3.2 percent of all poor children end up in EDs each year because of an attack, compared with only 1.6 percent of other children. It is anomalous then that respiratory allergies are reported to be more common among other children than among poor children. It is likely that the same symptoms are more likely to be diagnosed as allergies (rather than as, for example, a large number of acute illnesses) among higher-income children. Finally, a surprisingly large fraction of children have frequent diarrhea or three or more ear infections in a year, or both, which indicates a high burden of infectious disease. Although it is not shown in this exhibit, the incidence of ear infection is high even among older children; 5 percent of poor teens report three or more ear infections in a year. Since ear infections are only one manifestation of acute infectious disease (because many ear infections are complications of illnesses such as colds), these numbers suggest that the burden of acute illness among poor children merits fur-

ther attention.

The contrast between the relatively small numbers of school days missed and the relatively large numbers of illnesses further suggests that many children go to school sick. This observation reinforces the potential role of schools in improving public health by monitoring and even treating minor childhood illnesses.

■ **Regression results.** In the NHIS, some health questions are asked only of a subset of children, called the "sample child," in which one child is chosen randomly from each sample household. We focus on this sample in the first two rows of Exhibit 2 and in the remaining exhibits. The third row of Exhibit 2 shows that expanding the sample to include all available children for 2001–2005 has relatively small effects on the estimated coefficients, except for the youngest group, which is smaller and therefore more subject to sampling error.[15]

The last three rows of Exhibit 2 examine the same time period as Case and colleagues did, 1986–1995. Comparing the third and fourth rows shows that the effects of poverty are slightly stronger for all child age groups in the earlier period. However, the standard errors are large enough that we cannot reject the null hypothesis that the relationship among poverty, health, and child age is the same in the two samples.

Row 5 shows that if we follow Case and colleagues in dropping children with missing income rather than imputing income, the coefficients on poverty rise but show a qualitatively similar pattern with age. Row 6 shows that if we use an imputed measure of continuous income (as in Case and colleagues) rather than imputing poverty, the effect of income also rises with age. Thus, our results are qualitatively similar to those of Case and colleagues, even though we focused on poverty and imputed income.[16]

Probability of being in good health. The estimates in the first row of Exhibit 2, with no controls, show that poor children ages 2–3 are 15.6 percentage points less likely to be reported to be in excellent or very good health than other children are and that this gap widens to 19.2 percentage points by the teen years. This is a very large difference.

The estimates shown in row 2 show a smaller, but still statistically significant and quantitatively important, effect of poverty, which increases with child age (although not as steeply as the results in row 1 suggest). Conditional on the controls included in the row 2 model, poor children are 5–11 percent less likely to be in good or excellent health, depending on their ages. It is hardly surprising that the effect of being poor should be reduced by including controls such as parents' education and whether the father is present, since these variables are likely to be highly correlated with poverty. But the fact that poverty still matters when these characteristics of families are controlled for suggests that there may be a role for poverty per se.

Effect of specific health variables. Exhibit 3 shows estimates from models similar to those in the first row of Exhibit 2, except that they also include specific health

EXHIBIT 2
Regression Coefficients For Linear Probability Models Of Excellent/Very Good Health Among Children Ages 2–17, By Age Group, Selected Years 1986–2005

	Age group			
	2–3	**4–8**	**9–12**	**13–17**
1. Years: 2001–2005, sample child only, no controls				
Poor	−0.156	−0.148	−0.188	−0.192
	[0.017][a]	[0.013][a]	[0.015][a]	[0.013][a]
N	6,061	13,008	10,724	14,428
2. Years: 2001–2005, sample child only, full controls				
Poor	−0.088	−0.053	−0.098	−0.108
	[0.020][b]	[0.015][b]	[0.016][a]	[0.014][a]
N	6,061	13,008	10,724	14,428
3. Years: 2001–2005, full sample, full controls				
Poor	−0.072	−0.060	−0.090	−0.095
	[0.012][a]	[0.009][a]	[0.010][a]	[0.010][a]
N	12,404	31,643	26,751	31,405
4. Years: 1986–1995, full sample, full controls				
Poor	−0.075	−0.077	−0.097	−0.102
	[0.011][a]	[0.008][a]	[0.008][a]	[0.011][a]
N	30,638	78,703	61,874	73,560
5. Years: 1986–1995, full sample, full controls, drop missing income				
Poor	−0.094	−0.095	−0.119	−0.137
	[0.011][a]	[0.007][a]	[0.008][a]	[0.008][a]
N	27,299	69,663	54,103	63,519
6. Years: 1986–1995, full sample, full controls, drop missing income				
Log (income)[c]	0.049	0.051	0.062	0.073
	[0.004][a]	[0.003][a]	[0.003][a]	[0.004][a]
N	27,299	69,663	54,103	63,519

SOURCE: Data from the National Health Interview Survey (NHIS), various years.

NOTES: Robust standard errors are in brackets. See text for a list of other covariates that are included in the model.

[a] Significance at the 99% level of confidence.

[b] Significance at the 95% level of confidence.

[c] The NHIS contains information on household income for twenty-seven income categories. We assigned household income as the midpoint of the household income category.

measures.[17] The health variables in the exhibit are ordered in roughly five groups: low birthweight, asthma, mental health, trouble seeing/hearing/speaking, and other activity limitations. The R^2s for the regression show that including these health variables approximately doubles the fraction of the variation in health status that is explained by the models.

Low birthweight is not a statistically significant determinant of children's overall health status in these models, but as discussed above, the effects of low birthweight may be mediated through other related health conditions.

The asthma variables have highly significant effects on overall health status. For example, among children ages 4–8, having been told that the child has asthma re-

EXHIBIT 3
Regression Coefficients For Linear Probability Models Of Excellent/Very Good Health Among Children Ages 2–17, By Age Group, 2001–2005

	Age group			
	2–3	**4–8**	**9–12**	**13–17**
Full controls				
Poor	−0.088	−0.053	−0.098	−0.108
	[0.020][a]	[0.015][a]	[0.016][b]	[0.014][b]
R^2	0.062	0.061	0.076	0.070
Full controls + health measures				
Poor	−0.075	−0.042	−0.083	−0.087
	[0.019][a]	[0.014][a]	[0.016][b]	[0.014][b]
Birthweight <2,500 grams	−0.016	−0.025	−0.022	0.002
	[0.026]	[0.020]	[0.022]	[0.019]
Birthweight 1,500–2,500 grams	−0.016	−0.060	−0.042	−0.011
	[0.043]	[0.039]	[0.034]	[0.030]
Ever told asthma	−0.091	−0.057	−0.059	−0.018
	[0.033][a]	[0.016][a]	[0.017][a]	[0.012]
Asthma/respiratory problem causes limit	−0.301	−0.042	−0.133	−0.154
	[0.088][a]	[0.059]	[0.064]	[0.053][a]
Asthma attack past 12 months	−0.010	−0.093	−0.086	−0.065
	[0.056]	[0.026][a]	[0.028][a]	[0.021][a]
ER due to asthma past 12 months	−0.014	−0.093	−0.054	−0.181
	[0.063]	[0.039]	[0.049]	[0.046][a]
Ever told mental problem	−0.122	−0.068	−0.021	−0.008
	[0.056]	[0.022][a]	[0.020]	[0.018]
Mental problem causes limit	−0.007	0.030	−0.017	0.047
	[0.083]	[0.043]	[0.036]	[0.032]
S&D questions, ages 4–17	–[c]	−0.022	−0.023	−0.022
		[0.003][b]	[0.003][b]	[0.003][b]
Ever told ADHD	–[c]	−0.003	0.011	−0.009
		[0.030]	[0.018]	[0.018]
ADHD causes limit	–[c]	0.029	−0.040	0.109
		[0.061]	[0.043]	[0.042]
Trouble hearing or seeing	−0.108	−0.072	−0.061	−0.078
	[0.042]	[0.019][a]	[0.021][a]	[0.018][a]
Hearing/vision problems cause limit	−0.134	0.062	0.054	0.131
	[0.118]	[0.069]	[0.058]	[0.062]
Any activity limit	−0.112	−0.141	−0.098	−0.212
	[0.058]	[0.039][a]	[0.036]	[0.033][b]
Speech problem causes limit	0.065	0.047	−0.006	−0.057
	[0.067]	[0.041]	[0.047]	[0.069]
Bone/joint/muscle problem causes limit	0.003	−0.139	−0.294	−0.075
	[0.109]	[0.099]	[0.121]	[0.089]
Respiratory allergy past 12 months	−0.091	−0.038	−0.032	−0.041
	[0.024][a]	[0.013][a]	[0.012]	[0.012][a]
R^2	0.121	0.122	0.136	0.132
N	6,061	13,008	10,724	14,428

SOURCE: National Health Interview Survey (NHIS), 2001–2005 Sample Children Files, Children Ages 2–17.

NOTES: Robust standard errors in brackets. See text for a list of other covariates that are included in the model. ER is emergency room. S&D is "Strengths and Difficulties" questionnaire. ADHD is attention deficit hyperactivity disorder. The model also included linear birthweight, but it was not statistically significant.

[a] Significance at the 95% level of confidence.

[b] Significance at the 99% level of confidence.

[c] Not applicable.

duces by 5.7 percentage points the probability that the child is reported to be in excellent or very good health. If the child has also had an asthma attack in the past twelve months, this probability is reduced by a further 9.3 percentage points.

Effect of mother's perceptions. The "Strengths and Difficulties" questions are predictive of overall health for all three of the age groups for which they are available, while the other mental health measures have generally insignificant effects. These results suggest that parents of children with ADHD, for example, do not necessarily think of these children as being in poorer overall health because of their condition. Thus, although mental health conditions appear to be among the most common and limiting conditions of childhood, they are not necessarily recognized as health conditions. The same is apparently true of limitations due to speech problems. On the other hand, Exhibit 3 suggests that trouble seeing or hearing is something that is perceived as reducing health status, as are activity limitations and respiratory allergies. These last two sources of limitation have much bigger effects on the overall health status of the oldest children.

It is perhaps surprising that the estimated effect of income is only reduced 15–20 percent by the inclusion of the specific health measures. We have seen that poor children are more likely than others to suffer from many chronic conditions and are more likely than other children with the same conditions to be limited by them. Hence, one might expect that controlling for the prevalence of specific conditions and activity limitations would reduce, or even eliminate, the estimated effect of poverty on general health status. Moreover, many of the health variables listed in Exhibit 3 are statistically significant determinants of the child's reported overall health status, which suggests that the overall health status measure contains a good deal of "signal" regarding the child's health.

The explanation for this puzzle might be that there are omitted health measures that affect a mother's perceptions of her child's overall health status and are more common among poor children than among other children. For example, frequent acute illnesses might affect a mother's evaluation of her child's health, although these are not tracked in the NHIS. Similarly, conditions such as untreated tooth decay are more common in poor children and may cause pain or other symptoms but are not tracked in the NHIS. According to the Centers for Disease Control and Prevention (CDC), poor children have almost twelve times more restricted activity days because of dental problems than higher-income children, and untreated dental disease can lead to problems eating, speaking, and learning.[18]

Interaction of health measures with poverty status. Finally, Exhibit 4 shows models similar to those in Exhibit 3 but also shows the interaction of the specific health measures with poverty status. These regressions ask whether a particular health condition has a different impact on a child's reported health status in poor families than it does in other families. Because the inclusion of many interactions is very demanding of the data, we reduced the number of specific health conditions listed by, for example, including only one measure of asthma. We also included one re-

EXHIBIT 4
Regression Coefficients For Linear Probability Models Of Excellent/Very Good Health, Including Interaction of Health Measures With Poverty, Among Children Ages 2–17, By Age Group, 2001–2005

	Age group				
	2–17	**2–3**	**4–8**	**9–12**	**13–17**
Poor	−0.059 [0.009][a]	−0.075 [0.020][b]	−0.036 [0.015][b]	−0.07 [0.007][a]	−0.075 [0.018][b]
Low birthweight	−0.026 [0.008][b]	−0.021 [0.019]	−0.034 [0.016][b]	−0.032 [0.027]	−0.009 [0.015]
Interacted with poor	0.006 [0.023]	0.023 [0.051]	−0.024 [0.039]	0.048 [0.019]	−0.002 [0.046]
Ever told asthma	−0.098 [0.007][a]	−0.149 [0.025][a]	−0.125 [0.014][a]	−0.106 [0.013][a]	−0.065 [0.011][a]
Interacted with poor	−0.076 [0.021][b]	0.012 [0.056]	−0.067 [0.038]	−0.083 [0.039]	−0.097 [0.037]
Ever told mental problem	−0.058 [0.011][a]	−0.102 [0.055]	−0.095 [0.024][a]	−0.051 [0.006][a]	−0.036 [0.018]
Interacted with poor	0.021 [0.029]	−0.026 [0.113]	0.019 [0.054]	0.028 [0.017]	0.068 [0.049]
Trouble hearing or seeing	−0.082 [0.012][a]	−0.158 [0.054][b]	−0.082 [0.022][a]	−0.065 [0.015][b]	−0.086 [0.019][a]
Interacted with poor	−0.027 [0.031]	0.132 [0.090]	−0.001 [0.054]	−0.039 [0.028]	−0.058 [0.056]
Any activity limit	−0.155 [0.012][a]	−0.129 [0.044][b]	−0.134 [0.023][a]	−0.131 [0.011][a]	−0.193 [0.022][a]
Interacted with poor	−0.043 [0.030]	−0.166 [0.087]	0.026 [0.054]	−0.101 [0.056]	−0.048 [0.053]
R^2	0.109	0.111	0.106	0.120	0.112
N	44,221	6,061	13,008	10,724	14,428

SOURCE: National Health Interview Survey (NHIS), 2001–2005 Sample Children Files, Children Ages 2–17.
NOTES: Robust standard errors in brackets. See text for a list of other covariates that are included in the model.
[a] Significance at the 99% level of confidence.
[b] Significance at the 95% level of confidence.

gression, pooling children ages 2–17 to increase the sample size.

There is some evidence here that asthma has a more negative effect on poor children than on other children, at least in the pooled sample. The other interactions are statistically insignificant, although the point estimates on the interactions for activity limitations are large and negative. Hence, there is some evidence that asthma has worse effects on poor children and a suggestion that activity limitations might be worse for poor children.[19]

Implications For Policy

Consistent with past research using earlier data, poor children in 2001–2005 were more subject than richer children to virtually every type of negative health shock. Hence, the large income-related difference in the incidence of health conditions is of great importance in explaining the overall differences in health status between poor children and others. We updated the previous research by showing

that this is also true for mental health conditions. These results suggest that policymakers should be concerned not only with getting afflicted children into care, but also with understanding and reducing income-related differences in the incidence of health insults.

We found that asthma, mental health problems, and trouble seeing or hearing are among the most limiting chronic conditions of childhood. Moreover, although these conditions impair the health of all afflicted children, poor children with these conditions are more likely to be limited in their activities, and the extent to which children are limited by their chronic conditions tends to grow faster over time for poor children.

These findings suggest that if we are concerned about health disparities, we need to protect, expand, and restore funding for the treatment of poor children with chronic conditions, so that they will not be limited by them. Expanding funding for early intervention in children with chronic conditions could help prevent future limitations.

■ **Impact of the DRA.** Unfortunately, many recent policies are moving in the opposite direction. The DRA of 2005 requires explicit documentation of citizenship for new applications and renewals. We know that this will reduce enrollments and reduce the numbers of citizen children receiving care. For example, before the DRA, infants whose deliveries were paid for by Medicaid were entitled to Medicaid coverage for one year. In this case, both the citizenship of the child and the family income of the child are known to qualify the child for Medicaid. However, now the child will not be covered unless parents go through the application procedure; the result will be that many infants will go uncovered during at least part of their first year.

The DRA also allows states to adopt cost sharing (copayments) or premiums, or both, for Medicaid. Providers are now allowed to deny care to those who cannot afford the copayments. States can also end Medicaid coverage for families who do not pay within sixty days. These changes will reduce the use of care.

■ **Future of SCHIP.** The State Children's Health Insurance Program (SCHIP), which insures many children with family incomes higher than Medicaid income cutoffs, could face severe shortfalls in funding if the pending reauthorization of the program in 2007 freezes annual funding at 2007 levels. The number of SCHIP-covered children is already falling in many states (such as Florida and Texas) as they adopt tighter eligibility requirements. Flat or declining budgets in the face of rising health care costs will make it increasingly difficult to maintain available services, let alone to expand services to areas such as mental health. We can only hope that recognition of the extent to which poor children continue to bear a disproportionately high cost of ill health, both because of a higher frequency of health conditions and because of a greater probability of being limited by those conditions, will lead to a reversal of these cutbacks in health services for poor children.

The authors are grateful to the Department of Economics at the University of California, Los Angeles, for

supporting this research. All errors are the authors' own.

NOTES

1. This generalization holds within but not necessarily across U.S. ethnic groups. For example, although immigrant Latinos are generally poorer than non-Hispanic whites, they have equally good birth outcomes.
2. For the United States, see A. Case, D. Lubotsky, and C. Paxson, "Economic Status and Health in Childhood: The Origins of the Gradient," *American Economic Review* 92, no. 5 (2002): 1308–1334. For Canada, see J. Currie and M. Stabile, "Socioeconomic Status and Health: Why Is the Relationship Stronger for Older Children?" *American Economic Review* 93, no. 5 (2003): 1813–1823. For the United Kingdom, see A. Currie, M.A. Shields, and S.W. Price, "Is the Child Health/Family Income Gradient Universal? Evidence from England," Discussion Paper no. 1328 (Bonn: IZA, 2004).
3. U.S. Bureau of the Census, "People in Families by Family Structure, Age, and Sex, Iterated by Income-to-Poverty Ratio and Race: 2004," http://pubdb3.census.gov/macro/032005/pov/new02_100_01.htm (accessed 27 December 2006).
4. P.W. Newacheck, "Poverty and Childhood Chronic Illness," *Archives of Pediatrics and Adolescent Medicine* 148, no. 11 (1994): 1143–1149; P.W. Newacheck and N. Halfon, "Prevalence and Impact of Disabling Chronic Conditions in Childhood," *American Journal of Public Health* 88, no. 4 (1998): 610–617; and Case et al., "Economic Status and Health."
5. For further information, see National Center for Health Statistics, "National Health Interview Survey (NHIS)," 21 December 2006, http://www.cdc.gov/nchs/about/major/nhis/quest_data_related_doc.htm (accessed 27 December 2006).
6. Case et al., "Economic Status and Health."
7. See S. Black, P. Devereux, and K. Salvanes, "From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes," NBER Working Paper no. 11796 (Cambridge, Mass.: National Bureau of Economic Research, 2005); J. Currie and E. Moretti, "Biology as Destiny? Short and Long-Run Determinants of Intergenerational Transmission of Birth Weight," NBER Working Paper no. 11567 (Cambridge, Mass.: NBER, 2005); P. Oreopoulos et al., "Short, Medium, and Long Term Consequences of Poor Infant Health: An Analysis using Siblings and Twins," NBER Working Paper no. 11998 (Cambridge, Mass.: NBER, 2005); and H. Royer, "Separated at Girth: Estimating the Long-Run and Intergenerational Effects of Low Birth Weight Using Twins" (Ann Arbor: School of Public Health, University of Michigan, 2005).
8. K.M. Linnet et al., "Gestational Age, Birth Weight, and the Risk of Hyperkinetic Disorder," *Archives of Disease in Childhood* 91, no. 8 (2006): 655–660.
9. U.S. Environmental Protection Agency, "Asthma Facts," Pub. no. EPA 402-F-04-019, May 2006, http://www.epa.gov/asthma/pdfs/asthma_fact_sheet_en.pdf (accessed 3 January 2007).
10. As of 1999, one in five children suffered some impairment from a mental health condition, 11 percent were moderately impaired, and 5 percent were seriously impaired. This latter figure is similar to what we report in Exhibit 1. U.S. Department of Health and Human Services, *Mental Health: A Report of the Surgeon General*, 1999, http://mentalhealth.samhsa.gov/cmhs/surgeongeneral/surgeongeneralrpt.asp (accessed 3 January 2007).
11. To construct the measure of whether mental health problems cause limits, we used answers to questions about whether learning disabilities, developmental delays, mental retardation, or other mental problems cause limits.
12. For discussion of inadequate asthma management, see J.S. Halterman et al., "Inadequate Therapy for Asthma among Children in the United States," *Pediatrics* 105, no. 1, Part 3 (2000): 272–276.
13. See J. Currie and M. Stabile, "Child Mental Health and Human Capital Accumulation: The Case of ADHD," *Journal of Health Economics* (forthcoming); and R.A. Barkley et al., "The Adolescent Outcome of Hyperactive Children Diagnosed by Research Criteria: I. An Eight-Year Prospective Follow-Up Study," *Journal of the American Academy of Child and Adolescent Psychiatry* 29, no. 4 (1990): 546–557. Also see R. Miech et al., "Low Socioeconomic Status and Mental Disorders: A Longitudinal Study of Selection and Causation during Young Adulthood," *American Journal of Sociology* 104, no. 4 (1999): 1096–1131.
14. R.J. Bonnie, C.E. Fulco, and C.T. Liverman, eds., *Reducing the Burden of Injury* (Washington: National Academies Press, 1999).
15. We also estimated ordered probits using the five health states (1 = excellent, 5 = poor). When we did this, we got estimates that were qualitatively similar to those in Exhibit 2. Specifically, the coefficients on "poor" for the four age groups were 0.215, 0.179, 0.260, and 0.266. All are statistically significant.

16. We also found that the relationship between income and health is smaller in the 0–1 age range than in the 2–3 age range, so our use of 2–3-year-olds rather than 0–3-year-olds changed our results somewhat relative to those of Case and colleagues. If we estimated ordered probits that use the full five-point health scale rather than dichotomizing health status for 1986 to 1995, used the exact same age ranges, dropped missing income, and used log (income) rather than poverty, we got results very similar to those of Case and colleagues. When we did this, we got estimates for the four age groups of −0.13, −0.16, −0.20, and −0.22, which can be compared to Case and colleagues' reported estimates of −0.11, −0.16, −0.19, and −0.22.
17. To reduce the number of measures to be included, we conducted age-specific factor analyses of the specific health measures on the overall health measure and kept any factor that had a weight of more than 0.3.
18. Centers for Disease Control and Prevention, *Preventing Chronic Diseases: Investing Wisely in Health*, *Preventing Dental Caries* (Washington: CDC, 6 April 2004). In addition to the lack of information about acute illnesses, injuries, and dental caries, it would be useful to track obesity and relate it to overall health status. See A.A. Hedley et al., "Prevalence of Overweight and Obesity among U.S. Children, Adolescents, and Adults, 1999–2002," *Journal of the American Medical Association* 291, no. 23 (2004): 2847–2850. Although the NHIS does collect information about child height and weight, the data are not considered to be of high quality and are not released in the public-use data set.
19. Alternatively, low-income mothers may report worse health status for any objective measures of health. See P. Franks, M.R. Gold, and K. Fiscella, "Sociodemographics, Self-Rated Health, and Mortality in the U.S.," *Social Science and Medicine* 56, no. 12 (2003): 2505–2514. However, in this case, one might expect to see more significant interaction terms in the Exhibit 4.