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ABSTRACT

Case, Lubotsky, and Paxson (2001) show that the well-known relationship between socioeconomic status (SES) and health exists in childhood and grows more pronounced with age. However, in cross-sectional data, it is difficult to distinguish between two possible explanations. The first is that low-SES children are less able to respond to a given health shock. The second is that low-SES children experience more shocks. This study shows, using panel data on Canadian children, that: (1) the gradient researchers estimate in the cross section is very similar to that estimated previously using U.S. children; (2) both high- and low-SES children recover from past health shocks to about the same degree; and (3) the relationship between SES and health grows stronger over time mainly because low-SES children receive more negative health shocks. In addition, researchers examine the effect of health shocks on math and reading scores. They find that health shocks affect test scores and future health in very similar ways. The results suggest that public policy aimed at reducing SES-related health differentials in children should focus on reducing the incidence of health shocks as well as on reducing disparities in access to palliative care. (Contains 17 references.) (Author/SM)

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# SOCIOECONOMIC STATUS AND HEALTH: WHY IS THE RELATIONSHIP STRONGER FOR OLDER CHILDREN?

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## ABSTRACT

Case, Lubotsky, and Paxson (2001) show that the well-known relationship between socio-economic status (SES) and health exists in childhood and grows more pronounced with age. However, in cross-sectional data it is difficult to distinguish between two possible explanations. The first is that low-SES children are less able to respond to a given health shock. The second is that low SES children experience more shocks. We show, using panel data on Canadian children that: 1) the gradient we estimate in the cross section is very similar to that estimated previously using U.S. children; 2) both high and low-SES children recover from past health shocks to about the same degree; and 3) that the relationship between SES and health grows stronger over time mainly because low-SES children receive more negative health shocks. In addition, we examine the effect of health shocks on math and reading scores. We find that health shocks affect test scores and future health in very similar ways. Our results suggest that public policy aimed at reducing SES-related health differentials in children should focus on reducing the incidence of health shocks as well as on reducing disparities in access to palliative care.



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The relationship between socioeconomic status and health is one of the most robust and well documented findings in social science. However, the reasons for the relationship are less clear since plausible causal mechanisms run in both directions. Case, Lubotsky, and Paxson (2001) look at children in order to find the "origins of the gradient", since the health of children may be assumed to have relatively little impact on their own socioeconomic status. They show that the well-known cross-sectional relationship between SES and health exists in childhood and is more pronounced among older than among younger children. Since poor health in childhood is likely to affect adult well-being directly through its effects on health, and indirectly through its effects on other forms of human capital accumulation, it is important to try to address the causes of SES-related gradients in health status among children.

However, in a cross-section it is not possible to distinguish between two different possible mechanisms underlying a steepening gradient. On the one hand, it is possible that low-SES children are less able to respond to a given health shock, so that the negative effects of health shocks persist and accumulate over time. This model would imply that low-SES children are in need of better medical care so that they can respond to health shocks in the same way as higher-SES children. On the other hand, it is possible that low-SES children respond to health shocks in a way that is similar to high-SES children, but are just subject to more shocks. This model implies that SES-related gradients can be reduced by addressing the reasons why low-SES children are more likely to be subject to health shocks. This distinction is important for policy because it implies that it may be productive to spend social resources on measures designed to reduce the arrival rate of health shocks as well as continuing to improve children's access to palliative medical care.

We examine these hypotheses using a panel of data on Canadian children from the National Survey of Children and Youth (NLSCY). We confirm that the gradient steepens in cross-section, and show that this result is robust to controls for cohort effects. However, we find little evidence that the long-term effects of health shocks on future health are different for high-SES and low-SES children, even though in the short run, low-SES children suffer greater health losses than high-SES children after the arrival of a health shock. Hence, we infer that the cross-sectional relationship between health, income (or maternal education), and age arises primarily because low income children are more likely to be subject to health shocks

In addition to the negative effects of poor child health on health in later life, it is possible that poor health disadvantages children by affecting their cognitive and/or academic functioning. We examine this hypothesis directly by utilizing information about the mathematics and reading test scores of children in our sample. These estimates indicate that poor health in childhood has negative effects on children's test scores and positive effects on the probability that they have repeated grades even some years later. However, although we find some evidence that higher maternal education reduces the immediate negative effect of health shocks, we find little evidence that the long-term effects of poor health or health shocks differs by SES.

The rest of the paper proceeds as follows: Section 1 provides some background regarding the relationship between SES and health. Sections 2 and 3 provide an overview of the data and methods. Results appear in Section 4, and Section 5 offers some concluding remarks.

## 1. Background Regarding the Relationship Between SES and Health

There is a vast literature documenting the relationship between socio-economic status and health (see Marmot and Wilkinson, 1999 for a review). However, it has been difficult to determine whether the relationship exists primarily because health affects socioeconomic status, whether socioeconomic status has a direct impact on health, or whether both are affected by some third factor (such as rate of time preferences, c.f. Fuchs (1982)). Deaton and Paxson (1999a,b) emphasize the difficulty of inferring a causal relationship from aggregate cross-country or cross-state data, as has been done in many previous studies. Smith (1998) proposes that it may be difficult to find a single correct answer to this question of causality since SES may affect health in childhood, while the direction of causality may run the other way among adults. Deaton and Paxson (1999b) present some evidence regarding the SES-health relationship among U.S. adolescents, while Power and Matthew (1997) and Ford *et al.* (1994) have investigated health-SES gradients among adolescents in the United Kingdom and in Scotland, respectively. All but Ford *et al.* find the expected positive relationship.

However, other than Case, Lubotsky and Paxson (CLP), we know of no other study that examines the way that the relationship between SES and health changes with age among children. In a related study, Currie and Hyson (1999) ask whether the long run impact of low birthweight differs with socioeconomic status in a cohort of British children born in 1958. They found that while low birthweight had a persistent negative impact on a range of outcomes, there was little evidence that its effects varied with socioeconomic status, though low-SES children were more likely to suffer from low birthweight to begin with.

This latter finding is consistent with a great deal of evidence that low-SES children are more likely to suffer negative health shocks than high-SES children. For example, Newacheck *et al.* (1994) show that poor children are more likely than better-off children to suffer from a wide array of chronic conditions, while the Institute of Medicine (1999) reports that low-SES children are more likely to suffer from virtually all types of accidental injuries than higher-SES children, accidents being the leading cause of morbidity and death among children.

There is also a good deal of evidence that ill health in childhood affects adult health and SES through multiple pathways. For example David Barker and his collaborators (c.f. Eriksson et al. 2001; Forsen et al, 1999) emphasize the link between nutrition in the prenatal period and early childhood and adult heart disease. Marmot and Wadsworth (1997) review the literature linking these and many other child health outcomes to health in adulthood.

Beyond the direct connection between poor health in childhood and health in adulthood, poor health in childhood could affect adult well-being through its impact on educational attainment. Grossman (1997) provides a summary of this literature, and concludes that school missed because of ill health accounts for some but not all of the effect. Currie (2000) provides a review of literature linking anthropometric measures of child health to cognitive deficits. Given this literature, it is plausible that educational attainment may also be limited in some cases by the direct effects of poor health on cognitive functioning.

The extent to which the existence of public health insurance mitigates the effects of SES on health is an unresolved issue. The famous Black report in Great Britain concluded that the relationship between SES and health became more pronounced following the introduction of National Health Insurance, but it is possible that the differential would have widened even further in the absence of National Health. Similarly, previous research using Canadian data indicates that there is a significant relationship between health and household income even though Canadians have universal health insurance (c.f. Curtis *et al.*, 2001).

Currie (1995) shows that recent expansions of U.S. public health insurance programs to previously ineligible children narrowed socio-economic gaps in the utilization of medical care and health among children, although significant SES-related gaps remain even among children with common insurance status. Hence, the available evidence indicates that while public health insurance narrows SES-related gaps in health status, it does not eliminate them. It is, therefore, of interest to examine the way that the gradient varies with child age in this sample of Canadian children.

## 2. Data

We use data from the National Longitudinal Survey of Children and Youth (NLSCY). The NLSCY is a Canadian national longitudinal data set which surveyed children ages 0-11 and their families beginning in 1994. [1] Follow up surveys were conducted in 1996 and 1998. The initial sample consisted of 22,831 children in 1994. We restrict our sample to those children who were surveyed in each of the three survey years (14,169 children).

The NLSCY collects detailed information on the health and demographics of the child. While the older children are asked a small number of questions, the majority of the survey, including the questions used in our analysis, is answered by the person most knowledgeable about the child (the PMK). Demographic, labor force, income, and health information are also collected

[1] The survey included siblings, though we have not used this feature of the data in our analyses.

for the PMK and the spouse of the PMK. In most cases (92%) the PMK is also the child's mother. However, the PMK need not be the mother and need not be the same person in each survey. Because of this potential complication, we determine the education level of the mother using information about the PMK and the spouse of the PMK in all three survey years. We measure mother's education as follows: when the child's mother is also the PMK or the child's mother is the spouse of the PMK we use this information to calculate the mother's education. When no biological mother is present in the family in any of the three survey years we use the next closest female parent figure as the basis for calculating the mother's education. We then include dummy variables for the female parent figure being other than the biological mother, and/or for the PMK being other than the biological mother in all our analyses.

We use total household income as our measure of income. In cases where the household income is not reported, the NLSCY imputes household income from individual income sources or, in a small number of cases, from other demographic information. We therefore have a measure of household income for every child in our sample. We include a dummy variable for the imputation of household income in all our analyses. We also re-estimated all our analyses omitting individuals for whom income had been imputed in order to be sure that there was nothing peculiar about the income imputation process. Our analyses are robust to these checks.

The NLSCY contains a rich set of health related questions. The primary measure is the PMK-reported health status of the child. The PMK is asked to rate the health of the child on a scale of 1 to 5, with 1 being poor and 5 being excellent. We define poor health as the bottom three measures on this scale. We also use information on the child's chronic conditions (these include allergies, asthma, heart disease, bronchitis, epilepsy, cerebral palsy, kidney troubles, mental troubles, learning disabilities, psychological disabilities, and a category for other chronic conditions), information on whether the child was hospitalized in the past year, and whether the child is limited in the types of activity he or she can do. Since asthma is by far the most common chronic condition, we examine the incidence of asthma separately in some of our analyses.

It is likely that all self-reported measures of health status suffer from some biases (c.f. Baker, Stabile, and Deri, 2001), and some of these biases may vary with socio-economic status. For example, mothers who are in poor health themselves may be more likely to report that their child is in ill health. Or, children of higher SES may be more likely to be diagnosed given that they have chronic conditions. Similarly, mothers may vary in their assessment of whether a child has activity limitations or is need of doctor visits or even hospitalization. We take an agnostic view about which measures of child health are "best" and examine the full range of available measures. We also verify that the self-reported measures of health have content by showing that they are related to objectively measured test scores.

The NLSCY collects information on both math and reading test scores. Math and reading tests were administered in schools to children in grades two through ten. Of the 9,542 children eligible to receive the tests, 86 percent of parents consented to have the school board administer the tests and 97 percent of school boards consented to conduct the tests. However, due to administrative problems, only 65 percent of the administered tests were returned to Statistics Canada in 1998. Therefore, of the original 9,542 children eligible to take the test, we have test scores for only 5,153 children.[2] Statistics Canada has conducted an analysis of the nonresponse,

[2] The response rate for the 1996 was significantly higher (closer to 75 percent). Using the 1996 test scores rather than the 1998 test scores yields results that are qualitatively similar to those reported below.

and finds that there is very little difference between responders and nonresponders along observable dimensions (such as gender, type of school, whether the children had ever repeated a grade, or the importance that the PMK attaches to education).

The math test was a shortened version of the Canadian Achievement Test Center's Mathematical Operations test, second edition. It measures the student's ability to do addition, subtraction, multiplication and division on whole numbers, decimals, fractions, negatives, and exponents. Problem solving using percentages and the order of operations was also measured. A separate version of the test was constructed for each grade level (except for 9 and 10 which received the same test). The 1998 test included 20 questions at each level (except for level 9-10 which had 15 questions) plus 5 questions selected from the test of the next higher level. The reading comprehension test is also from the Canadian Achievement Test, second edition. Each test consists of questions about two passages, which are designed to test the student's ability to recall information, identify the main idea, and analyze the passage.

In order to avoid problems with test "ceilings", children were given a short assessment at home before they took the school tests. Children who scored perfectly on the home test, were given the test of the next highest grade level. The scores were then scaled using national norms from the Canadian Test Center. These procedures result in a distribution of test scores which is quite bell-shaped. In our empirical analysis, we analyze the probability that a child scored in the bottom quintile of this standardized test score distribution. This cutoff was chosen to allow us to focus on children who were low scoring.

Table 1a shows means for the main variables used in our analysis across the three survey years. The average age of the children in the sample was 4.9 years in 1994. Household income, in

1998 dollars (Canadian), averaged $50,000. Twelve percent of children were reported to be in poor health. Nineteen percent of the children reported suffering from asthma, and 26 percent reported having some chronic conditions. The incidence of poor health and activity limitations remain fairly constant across the survey years, while the incidence of asthma drops slightly as the children age (consistent with the literature on the incidence of asthma)[3] and the use of medical services falls. However, the likelihood that the child has any chronic condition increases with age, as one might expect if chronic conditions represent cumulative, permanent health shocks.

Table 1b shows the incidence of chronic conditions across different reported health states. Among those in poor health in 1998, 43 percent had at least one chronic condition in 1994 and 42 percent developed a new chronic condition between 1994 and 1998. Among those not in poor health, only 24 percent reported a chronic condition in 1994 and 18 percent developed a new condition by 1998. The pattern is similar among children with asthma in 1998, and among children with activity limitations. Overall, 26 percent of children reported having a chronic condition in 1994 and 21 percent of children developed a new chronic condition between 1994 and 1998.

### 3. Methods

The health status of children is assumed to evolve over time as follows. Children are born with an initial health stock, $H_0$. Children receive shocks to their health in the form of chronic conditions, diseases requiring hospitalization, or other shocks. SES contributes to the ability of a family to both detect and treat a chronic condition in the short run. In the longer-run, the effects

[3] In many cases, asthma symptoms decrease at puberty as airways become larger and more mature.

of the bad health shock dissipate (with treatment) and the health of a child can be partially restored. We assume that while children can come close to returning to health stock $H_{0,}$ they do not completely return to their original level. This conceptual model is consistent with models which treat health as a depreciating stock (c.f. Grossman, 2000), which must remain above a minimum level for survival, and which can be augmented by investment on the part of the individual (or family).

In this simple model, two things differentiate the health of low-SES children from the health of high-SES children. First, low-SES children may not deal with bad health shocks as effectively as high-SES children in the short-run. This may be due to information problems, or to resource constraints which cause delays in treatment or less effective treatment. Second, low-SES children may receive more health shocks than high SES children. This may be due to differences in lifestyle and/or environmental factors such as poor housing quality, lack of preventative care, inadequate nutrition, etc. Therefore, the health status of low-SES children remains lower than the health status of higher-SES children although low-SES children would eventually catch up to high-SES children if both types received only a single bad health shock. Figure 1 shows the stylized time-pattern of the health stock for low and high-SES children.

The following predictions emerge from this highly simplified model. First, there will be a positive relationship between SES and health. Second, with the arrival of any bad health shock, high-SES children and their families respond more quickly, and hence begin to recover more quickly, mitigating the effect of the bad health shock. Third, the relationship between SES and health will grow stronger as children age. This is primarily due to the higher arrival rate of chronic conditions for low-SES children. Fourth, bad health shocks in the past may affect health today if children do not fully recover from a negative shock. Fifth, the effects of past negative health shocks will not necessarily be mitigated by SES, since after a certain amount of time, low-SES children respond and begin to restore their health in the same way as high-SES children do.

In order to test the implications of our model, we begin by graphing the relationship between health measures, age, and SES. To obtain these figures, we pool data from the three waves of the survey. Figures 2a-2e show the distribution of our various health measures by age and whether income is above or below the Canadian low income cutoff[4]. The incidence of poor health is higher at every age for those children below the low-income cutoff, as shown in Figure 2a. Although we do not show the incidence of poor health by maternal education, the patterns are similar in that children with more highly educated mothers have a lower incidence of poor health at all ages. While there is a good deal of variation in the incidence of poor health among low-income children, it does appear that the gap between low and high income children widens with age, consistent with the hypothesis of a steepening gradient. It also appears that this is due primarily to increases in poor health among low-income children, since there is little evidence of an increase in poor health by age among higher income children.

The number of chronic conditions is shown by age and high or low-income in Figure 2b. Consistent with the model above, the number of chronic conditions reported rises over time for both high and low-income children. Among children aged 0 to 10, low-income children always have a higher number of chronic conditions, on average, than higher-income children. The incidence of asthma is higher for low income children though it declines over time.

[4] The low income cut-off is calculated by Statistics Canada and is based on income, location of residence, and family composition.

Hospitalizations are also consistently higher for low-income children, and again decline over time. Similarly, activity limitations are higher for low-income children, and while the pattern is not as clear as it is for poor self-reported health, the relationship does appear to steepen slightly with age. In summary, these graphs are consistent with the model presented above in that they show both a steepening gradient and a higher incidence of bad health shocks for lower-income children.

In order to investigate these relationships in a multivariate context, we first estimate models pooling the three waves of data. Estimates obtained from these regression models will be qualitatively similar to those obtained using cross-sectional data, since we make no attempt to use the panel nature of the data in these initial estimations (though we do correct the standard errors for clustering due to repeated observations on the same child). These regressions take the following form:

(1) $health_i = \alpha + \beta inc * age_i + \gamma \ln(inc)_i + \pi edu_i + age_i + t_t + \delta X_i + birth_i + \varepsilon_i$,

where *health* is a measure of child health, *inc*age* is the interaction between the log of family income and age. *Ln(inc)* is log family income, *edu* is a set of dummies for mother's education (less than high school, high school, some college, college), *age* is a complete set of age dummies, *t* is a set of time dummies, and *birth* is a set of birth year cohort dummies. In alternative specifications, we interact maternal education, rather than income, with child age.

We focus on family income and maternal education as two key indicators of SES, while the age and cohort dummies are intended to capture both changes in child behavior with age, and factors such as changes in the availability of treatments that might affect different cohorts. The vector $X$ includes the log of family size, a dummy variable for the sex of the child, a dummy variable for having a PMK that is not the biological mother, a dummy variable for having a female

PMK, a dummy variable for having two parents, a dummy variable for having imputed family income and the mother's age at birth. These variables are intended to capture other characteristics of the family which could affect child health. The subscript *i* denotes the individual child.

Previous work suggests that estimation of (1) should yield evidence of a health-SES gradient that increases with child age. That is, the coefficients on income, maternal education, and the interaction terms should all be positive (in the case where the dependent variable is poor health, these coefficients will be negative). We estimate this model using several different measures of child health, allowing us to observe the age pattern of child health status for various conditions.

We next exploit the panel nature of the data by estimating models of the following form:

$$\begin{aligned} 2) \quad & health98_i = \alpha + \beta shock94_i + \chi shock98_i \\ & + \delta \ln(inc)_i + \phi inc * shock_i + \gamma edu_i + age_i + \lambda X_i + \varepsilon_i \end{aligned}$$

where *health98* is a measure of child health in 1998, *shock* denotes a health shock in the indicated year and the other variables are defined as above. This specification allows us to test directly for differential effects of current and past health shocks by SES. By distinguishing between past shocks and more recent ones, we can also ask whether any differential effects of health shocks by SES persist over time, or, whether given enough time, high-SES and low-SES children respond similarly to health shocks.

We modify equation (2) above to examine the effects of poor health on test scores.

In these models, our dependent variable is an indicator variable equal to one if the child has a low test score (defined as a score in the lowest quintile) and zero otherwise. Using a zero/one indicator makes it easier to compare results estimated using these measures to those obtained using dichotomous measures of health status We regress this measure of low test scores on a dummy variable for being in poor health, our controls for SES, and interactions between the two. We also include other controls as outlined above.

## 4. Results

*a) Effects of Health Shocks on Health Status*

Estimates of equation (1) are presented in Table 2. The first panel shows models which include interactions between income and child age, while the second panel shows models that include interactions between maternal education and child age. Models are estimated using three different health measures: whether the child was in poor health, whether the child was hospitalized in the past year, and whether the child had a chronic condition.

The first 2 columns of Table 2 indicate that family income is negatively and significantly correlated with being in poor health, as is maternal education (measured using a dummy variable equal to one if the mother has more than high school). The interaction between log income and age is also negative and significant, confirming Case, Lubotsky, and Paxson's result that the gradient steepens over time for a parent-reported poor health measure in children.

Column 2 includes controls for cohort of birth. These dummy variables do not enter significantly into the model and have no effect on the other coefficients of interest, suggesting that there is no strong trend in poor health across cohorts. Interacting age with mother's education instead of log family income also produced a negative coefficient but this coefficient is smaller and is no longer significant at traditional levels. These results are reported in the lower panel of columns 1 and 2.

The third through sixth columns of Table 2 report estimates of similar specifications using whether or not the child has had any hospitalizations and whether the child has any chronic conditions (including asthma) as the dependent variable. Once again we find that children of low income are more likely to be hospitalized or to suffer from chronic conditions than higher income children. This is consistent with the hypothesis that low-income children receive a greater number of health shocks. However, using these alternative measures of health we do not find that the relationship between income and health becomes more pronounced as the children age. In fact, the interaction between income and age is significantly positive in the model of hospitalizations. Again, we report these results using both income and mother's education as measures of SES. The results are similar, though weaker, when we use maternal education rather than income as the measure of SES.

The estimates in columns (1) and (2) are not directly comparable to those in CLP, since CLP report ordered probits in which the health status variable varies from 1 (excellent) to 5 (poor), and they estimate separate models for different age groups. We have replicated this approach in Appendix Table 1. This table shows that the protective effect of income rises with child age in this sample of Canadian children in a very similar way to that shown in CLP. For example, in CLP's first specification (without maternal education) the key coefficient on log income falls by .140 as they move from 0 to 3 year olds to 13 to 15 year olds. In the comparable model estimated using our data set, the same coefficient falls by .121. Once education is included in the model, our gradient actually steepens somewhat more rapidly than that estimated by CLP. Thus, the fact that Canadian children have universal health insurance appears to have little effect on the steepening of the SES-health gradient.

Estimates of equation (2) are presented in Table 3. These models exploit the panel nature of the data by examining the temporal effects of health shocks. The first column of Table 3 reports estimates using poor health in 1998 as the dependent variable and examining the effect of past health shocks by including a dummy variable for whether the child had a chronic condition in 1994. The coefficient on this variable is positive and statistically significant. It is also quite large, suggesting that having a chronic condition in 1994 increases the probability that a child is reported to be in poor health in 1998 by 11 percentage points. Log family income is negative and significant suggesting that higher income lowers the probability of reporting poor health, even conditional on having a long-standing chronic condition. Since we observe three measures of household income for each child, we take the log of average household income over the three years as a proxy for permanent income. We have also estimated the model using one or more years of income data as individual controls and the results are robust to the measure of income used. Mother's education is also negative and significant.

The second column of Table 3 includes a dummy variable for whether a child developed a new chronic condition between 1994 and 1998 (this amounts to developing a new condition in 1996 or 1998 but our results are robust to restricting this to a new condition in 1998). The coefficient on a new chronic condition is positive and significant, and much larger than the coefficient for having a condition in 1994, suggesting that the immediate effects of a newly developed chronic condition are larger than the effects of past health shocks. Both family income and mother's education are negative and significant, as expected.

The model shown in column (3) includes an interaction term between the chronic condition in 1994 and family income, so that we can see if the effects of a past health shock differ with income. This interaction is not statistically significant suggesting that SES does not affect the extent to which a past health shock affects the child's health today. On the other hand, the model shown in column (4) includes an interaction between having a new chronic condition and income. This interaction is significant and negative, indicating that the negative effects of new chronic conditions are mitigated by income.

Finally, column (5) includes measures for chronic conditions in 1994 and developing a new chronic condition between 1994 and 1998, as well as the interaction between income and having a new chronic condition. These estimates suggest that a new chronic condition has a much greater effect on health than an old one, and that income mitigates the effect of the new condition, but not the effects of old conditions.

The bottom panel of Table 3 repeats these analyses using mother's education as the measure of SES. The results are qualitatively similar, although the difference between the effect of new and old chronic conditions on current health status is not as large.

The estimates in Table 3 suggest that low-SES individuals are less able to deal with newly arrived health shocks, but that the long-term effects of these shocks do not differ by SES. Both rich and poor children appear to suffer long-term negative consequences from chronic conditions.

In order to explore the robustness of this pattern to alternative measures of health, we estimate similar models using both narrower and broader measures of health shocks. Specifically, we first focus on a diagnosis of asthma as a narrower and more specific measure of a health shock. Asthma is the leading chronic disease of children in industrialized countries. Asthma is also the biggest cause of hospitalisation and health related absenteeism among children (Millar and Hill, 1998). Left untreated, the long-term costs and consequences of asthma are severe (Ungar and Coyte, 2001). As a broader measure of a health shock, we combine chronic conditions and hospitalizations. This broader measure allows for the fact that children may suffer long-term consequences from acute conditions, such as illness or accidents, as well as from chronic conditions.

Estimates using an indicator equal to one if the child had asthma are presented in Table 4. The model shown in column (1) indicates that having been diagnosed with asthma by 1994 has a significant negative effect on reported health status in 1998. Similarly, column (2) shows that developing asthma between 1994 and 1998 worsens reported health. Column (3) confirms that there is no relationship between income and the effect of a health shock in 1994, whereas, column (4) shows that income does help to protect against the effects of a more recent diagnosis. Finally, column (5) confirms that this pattern of results for recent health shocks holds up when asthma in 1994 is included in the model. We repeated the analysis including interactions between mother's education and the asthma indicators rather than the interactions with income, and got very similar estimates.

Table 5 presents estimates which use both whether a child had a chronic condition and whether a child was hospitalized in the past year as a measure of a health shock. The qualitative pattern of estimates is virtually identical to that shown in Table 3 and Table 4. While negative health shocks in 1994 affect the probability of being in poor health in 1998, there is no differential effect by SES. Further, current health shocks have a much larger effect on poor health than past shocks, and higher-SES families are better able to cope with shocks in the short term.

We also estimated similar models for the incidence of very low birthweight, defined as birthweight less than 1500 grams. Only .8% of our sample children were very low birthweight. We found that while very low birthweight increased the probability that a child was in poor health in 1998 significantly (by six percent), the main effect of very low birthweight became statistically insignificant (though larger) when we included an interaction between very low birthweight and log income or maternal education. Hence, we are unable to say definitively whether the effect of very low birthweight is mitigated by SES. If we include our measure of new chronic conditions (developed between 1994 and 1998), we find once again that the effect of very low birthweight remains statistically significant, and that SES mitigates the effects of these new conditions.

In summary, the evidence is strikingly consistent with the predictions of our model. Low-SES children are more likely to suffer health shocks than high-SES children. In the short-term, they suffer more from these shocks than higher-SES children. However, over the longer-term, both high-SES and low-SES children recover to the same extent from a given shock. Thus, the worsening gradient observed in the cross-section is likely due to the higher arrival rate of shocks, rather than to a lower recovery rate for SES children.

*b) Effects of Health on Test Scores*

We now turn to investigate the effects of health shocks and poor health on child test scores. Table 6 shows the effect of chronic conditions in 1994 and new chronic conditions in 1998 on the probability that a child is in the bottom quintile of the test score distribution in 1998. The first two panels show estimates using math scores, while the second two show estimates using reading scores. These estimates show that a child who was reported to have a chronic condition in 1994 is 2 (.7) percentage points more likely to be in the bottom quartile of the math (reading) test score distribution in 1998. Being diagnosed with a new chronic condition between 1994 and 1998 reduces math and reading scores by a much larger 3.7 and 3.1 percentage points respectively.

Higher income reduces the probability that a child has a low score, but interactions with income are not statistically significant in the models for math scores. Models estimated using maternal education as the measure of SES and including interactions with maternal education show a pattern similar to that in Tables 3, 4, and 5 in that there is no significant interaction between maternal education and having had a chronic condition in 1994, but there is a significant negative interaction between having a new chronic condition and maternal education. Thus, it appears that higher maternal education helps children to deal with new chronic conditions, but that there is no interaction between SES and older chronic conditions, at least in terms of effects on math scores.

The story is different for reading scores, in that there is no evidence that chronic conditions in 1994 affect reading scores in 1998. However, new chronic conditions have a negative effect on scores, which is mitigated by both income and maternal education. In summary, these estimates suggest that while new chronic conditions have a negative effect on test scores, which is mitigated by socio-economic status, there is no relationship between SES and the effects of older chronic conditions.

Table 7 presents similar estimates using poor health, rather than chronic conditions, as the measure of health shocks. These estimates are qualitatively similar to those in Table 6, with the exception that poor health in 1994 is more strongly correlated with low test scores than chronic conditions in 1994. Once again, we find that both high and low-SES children suffer similar long-term consequences of health shocks in 1994, although SES protects against the effects of more recent shocks.

The estimates in Tables 6 and 7 also provide some support for the use of PMK-reported measures of poor health and chronic conditions, since they show that these measures are correlated with objectively measured test scores.

## 5. Discussion and Conclusions

Case, Lubotsky, and Paxson study U.S. children, while we study a panel of Canadian children. Given the fact that Canadian children have universal health insurance, it is interesting to speculate on the extent to which our results might apply to American children. It is unfortunately not possible to do a similar investigation using a panel of U.S. children. As Case, Lubotsky, and Paxson note, the sample sizes available in the National Longitudinal Survey of Youths Child-Mother file are too small to support this type of analysis in part because the relevant questions were not asked to all children.[5] However, the fact that our estimates of the steepening gradient in the cross section are very similar to those obtained by CLP using U.S. data from other sources suggests that our findings may apply to U.S. children.

[5] Questions about chronic conditions were only asked to children who answered affirmatively to several questions about activity limitations. It appears that high SES children were more likely to make it through these screens, and hence to be asked about chronic conditions. The question about general health status was asked only to children six and older, limiting our ability to analyze it in this panel context. In contrast, in the NLSCY, all children were asked about chronic conditions and health status.

The main implication of our findings is that the health of low SES children worsens with age, not so much because they lack the resources to respond to health shocks (though we do find evidence that they respond more slowly) but because they are subject to more shocks. This implies that policies that focus only on reducing gaps in access to palliative care, such as expansions of public health insurance, are unlikely to fully close the SES-related gap in health. Rather, it is important to understand and address the reasons for a higher arrival rate of health shocks among low-SES children.

In addition to distinguishing between the possible SES-related differences in responses to shocks and SES-differentials in the arrival rate of shocks, we build on CLP by examining the effect of health shocks on cognitive test scores. Our results suggest that health shocks have effects on children's cognitive functioning which parallel the negative effects that they have on future health. Thus, we demonstrate two ways that health shocks in childhood are likely to affect future SES, through their direct effects on future health, and by lowering academic performance.

**References**

Baker, Michael, Mark Stabile, and Catherine Deri. "What Do Self-Reported Objective Measures of Health Measure?", NBER Working Paper #8419 (Cambridge, MA: National Bureau of Economic Research) August 2001.

Case, Anne, Darren Lubotsky and Christina Paxson. "Economic Status and Health in Childhood: The Origins of the Gradient", NBER Working Paper #8344 (Cambridge MA: National Bureau of Economic Research) June 2001.

Currie, Janet. "Socio-economic status and child health: Does public health insurance narrow the gap?", Scandinavian Journal of Economics, 97:4 (1995) 603-620.

Currie, Janet, and Rosemary Hyson. "Is the impact of health shocks cushioned by socioeconomic status? The case of low birthweight", American Economic Review 89:2 (May 1999) 245-250.

Curtis, L.J, M. D. Dooley, E. L. Lipman, D. H. Feeny. "The Role of Permanent Income and Family Structure in the Determination of Child Health in Canada", Health Economics, 10:4 (June 2001) 287-302.

Deaton, Angus. "Inequalities in income and inequalities in health", NBER Working Paper # 7141

(Cambridge, MA : National Bureau of Economic Research) 1999a.

Deaton, Angus and Christina Paxson. "Mortality, education, income, and inequality among American cohorts", NBER Working Paper #7140 (Cambridge, MA : National Bureau of Economic Research) 1999b.

Ford, G, R. Ecob, K. Hunt, S. Macintyre and others. "Patterns of Class Inequality in Health through the Lifespan: Class Gradients at 15, 35, and 55 years in the West of Scotland", Social Science and Medicine 39:8 (Oct. 1994) 1037-1050.

Fuchs, Victor. Economic Aspects of Health ( Chicago: University of Chicago Press for NBER) 1982.

Grossman, Michael. The Handbook of Health Economics, Joseph Newhouse and Anthony Culyer (eds) (New York: North Holland) 2000.

Grossman, Michael and Robert Kaestner (1997) "Effects of Education onHealth" in J.R. Behrman and N. Stacey (eds.) The Social Benefits of Education (University of Michigan Press, Ann Arbor MI) 69-123.

Institute of Medicine. Reducing the Burden of Injury Richard Bonnie (ed.) (Washington D.C.: National Academy Press) 1999.

Marmot, Michael and Michael Wadsworth (eds). "Fetal and early childhood environment : long-term health implications" (London: Royal Society of Medicine Press Limited)1997.

Marmot, Michael and Richard G. Wilkinson. "Social determinants of health" (Oxford: Oxford University Press) 1999.

Newacheck, Paul, W. "Poverty and Childhood Chronic Illness," Archives of Pediatric and Adolescent Medicine, 148 (Nov. 1994) 1143-1149.

Powers, Chris and S. Matthews. "Origins of Health Inequalities in a National Sample", Lancet 350:9091 (Nov 29, 1997) 1584-1589.

Smith, James P. "Socioeconomic status and health", American Economic Review, 88:2 (May 1998) 192-196.

**Table 1a: Means**

| | Cycle1 | Cycle 2 | Cycle 3 |
|---|---|---|---|
| Age | 4.93 | 6.91 | 8.85 |
| | (3.55) | (3.55) | (3.55) |
| Household Income | 50330 | 50538 | 57169 |
| | (33178) | (33972) | (39128) |
| PMK Female | 0.93 | 0.92 | 0.93 |
| | (0.26) | (0.27) | (0.25) |
| 2 Parent Family | 0.86 | 0.85 | 0.83 |
| | (0.34) | (0.36) | (0.38) |
| Mom High School or More | 0.58 | 0.58 | 0.58 |
| | (0.49) | (0.49) | (0.49) |
| Household Size | 4.14 | 4.21 | 4.25 |
| | (1.11) | (1.09) | (1.09) |
| Mom Age at Birth | 27.65 | 27.68 | 27.68 |
| | (4.85) | (4.84) | (4.86) |
| Poor Health | 0.12 | 0.12 | 0.13 |
| | (0.33) | (0.33) | (0.33) |
| Asthma | 0.19 | 0.18 | 0.17 |
| | (0.39) | (0.39) | (0.37) |
| Activity Limitation | 0.03 | 0.04 | 0.04 |
| | (0.18) | (0.18) | (0.21) |
| GP Visit | 2.78 | 2.06 | 1.76 |
| | (4.25) | (3.14) | (2.90) |
| Hospital | 0.07 | 0.05 | 0.04 |
| | (0.26) | (0.21) | (0.18) |
| Chronic Condition | 0.26 | 0.31 | 0.32 |
| | (0.44) | (0.46) | (0.47) |
| New Chronic Condition | -- | -- | 0.21 |
| | | | (0.41) |
| Math Scores | | | |
| Median | -- | 446 | 466 |
| Cut-off for Bottom Quintile | -- | 376 | 389 |
| Reading Scores | | | |
| Median | -- | 255 | 256 |
| Cut-off for Bottom Quintile | -- | 224 | 219 |
| # Observations | 14162 | 14162 | 14162 |

Note: Standard deviations in parenthesis

**Table 1b- Chronic Conditions (%)**

| | In Poor Health 1998 | Not in Poor Health 1998 | Has Asthma 1998 | Does Not Have Asthma 1998 | Has an Activity Limitation 1998 | Does Not Have an Activity Limitation 1998 | Whole Sample |
|---|---|---|---|---|---|---|---|
| Chronic Condition in 1994 | 42.73 | 23.78 | 47.10 | 22.05 | 63.45 | 24.46 | 26.20 |
| New Chronic Condition in 1996 | 30.57 | 15.38 | 33.16 | 14.18 | 39.40 | 16.29 | 17.32 |
| New Chronic Condition in 1998 | 41.79 | 18.34 | 49.70 | 15.70 | 58.39 | 19.60 | 21.33 |

Note: Table shows the percent of children in the state defined by the column who have chronic conditions in the year defined by the row.

**Table 2 – Pooled Results**

| | Poor Health | Poor Health | Hospitalizations | Hospitalizations | Chronic Conditions | Chronic Conditions |
|---|---|---|---|---|---|---|
| Cohort effects | No | Yes | No | Yes | No | Yes |
| *Interacting with Income* | | | | | | |
| Log Family Income * Age | -0.002** | -0.002** | 0.002** | 0.0020** | 0.002 | 0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Log Family Income | -0.029** | -0.029** | -0.021** | -0.022** | -0.026** | -0.026** |
| | (0.006) | (0.006) | (0.005) | (0.005) | (0.009) | (0.009) |
| Mom High School or More | -0.032** | -0.032** | 0.002 | 0.002 | 0.010 | 0.010 |
| | (0.004) | (0.004) | (0.003) | (0.003) | (0.007) | (0.007) |
| $R^2$ | 0.012 | 0.013 | 0.016 | 0.016 | 0.035 | 0.036 |
| # Observations | 41016 | 41016 | 40155 | 40155 | 41016 | 41016 |
| *Interacting with Mom's Education* | | | | | | |
| Mom High School or More * Age | -0.001 | -0.001 | 0.002** | 0.002** | 0.002 | 0.002 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) | (0.002) |
| Log Family Income | -0.041** | -0.041** | -0.008** | -0.008** | -0.016** | -0.016** |
| | (0.004) | (0.004) | (0.002) | (0.002) | (0.006) | (0.006) |
| Mom High School or More | -0.023** | -0.023** | -0.010* | -0.010* | -0.004 | -0.003 |
| | (0.008) | (0.008) | (0.006) | (0.006) | (0.011) | (0.011) |
| $R^2$ | 0.012 | 0.013 | 0.015 | 0.016 | 0.035 | 0.036 |
| # Observations | 41016 | 41016 | 40155 | 40155 | 41016 | 41016 |

Notes: Standard errors are in parentheses. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.

**Table 3 – Effects of Health Shocks on Poor Health**

| ***Interactions with Income*** | -1- | -2- | -3- | -4- | -5- |
|---|---|---|---|---|---|
| Chronic Condition in 1994 | 0.108** | | 0.257* | | 0.103** |
| | (0.008) | | (0.138) | | (0.007) |
| New Chronic Condition in 1998 | | 0.155** | | 0.725** | 0.723** |
| | | (0.009) | | (0.165) | (0.164) |
| Log of Average Income | -0.055** | -0.052** | -0.052** | -0.041** | -0.040** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.006) |
| Mom High School or More | -0.030** | -0.030** | -0.030** | -0.030** | -0.031** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| *Interactions* | | | | | |
| Log of Average Income * Chronic Condition in 1994 | | | -0.014 | | |
| | | | (0.013) | | |
| Log of Average Income * New Chronic Condition in 1998 | | | | -0.053** | -0.053** |
| | | | | (0.015) | (0.015) |
| $R^2$ | 0.033 | 0.049 | 0.033 | 0.051 | 0.068 |
| # Observations | 13789 | 13789 | 13789 | 13789 | 13789 |
| ***Interactions with Mom's Education*** | | | -6- | -7- | -8- |
| Chronic Condition in 1994 | | | 0.110** | | 0.103** |
| | | | (0.012) | | (0.007) |
| New Chronic Condition in 1998 | | | | 0.178** | 0.173** |
| | | | | (0.014) | (0.014) |
| Log of Average Income | | | -0.055** | -0.052** | -0.051** |
| | | | (0.007) | (0.007) | (0.006) |
| Mom High School Plus | | | -0.029** | -0.022** | -0.023** |
| | | | (0.007) | (0.007) | (0.007) |
| *Interactions* | | | | | |
| Mom High School Plus * Chronic Condition in 1994 | | | -0.003 | | |
| | | | (0.015) | | |
| Mom High School Plus * New Chronic Condition in 1998 | | | | -0.040** | -0.040** |
| | | | | (0.018) | (0.017) |
| $R^2$ | | | 0.033 | 0.050 | 0.067 |
| # Observations | | | 13789 | 13789 | 13789 |

Notes: Standard errors are in parentheses. Dependent variable is whether the child is in poor health in 1998. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.



**Table 4- Finer Measure of Bad Health Shock- Asthma**

| | -1- | -2- | -3- | -4- | -5- |
|---|---|---|---|---|---|
| Asthma 1994 | 0.136** | | 0.357* | | 0.149** |
| | (0.012) | | (0.209) | | (0.012) |
| New Asthma in 1998 | | 0.156** | | 0.717** | 0.760** |
| | | (0.015) | | (0.295) | (0.295) |
| Average of Log Family Income | -0.055** | -0.055** | -0.053** | -0.052** | -0.050** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| Mom High School or More | -0.030** | -0.029** | -0.030** | -0.028** | -0.029** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| *Interactions* | | | | | |
| Average of Log Family Income * Asthma 1994 | | | -0.021 | | |
| | | | (0.019) | | |
| Average of Log Family Income * New Asthma 1998 | | | | -0.052* | -0.055** |
| | | | | (0.027) | (0.027) |
| $R^2$ | 0.029 | 0.028 | 0.029 | 0.028 | 0.046 |
| # Observations | 13789 | 13789 | 13789 | 13789 | 13789 |

Notes: Standard errors are in parentheses. Dependent variable is whether the child is in poor health in 1998. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.

## Table 5- Broader Measure of Bad Health Shocks

| | -1- | -2- | -3- | -4- | -5- |
|---|---|---|---|---|---|
| Bad Health in 1994 | 0.100** | | 0.276** | | 0.093** |
| | (0.007) | | (0.129) | | (0.007) |
| New Bad Health in 1998 | | 0.159** | | 0.682** | 0.681** |
| | | (0.008) | | (0.159) | (0.157) |
| Average of Log Family Income | -0.054** | -0.052** | -0.049** | -0.041** | -0.039** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.006) |
| Mom High School or More | -0.030** | -0.030** | -0.030** | -0.030** | -0.032** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| *Interactions* | | | | | |
| Average of Log Family Income * Bad Health in 1994 | | | -0.016 | | |
| | | | (0.012) | | |
| Average of Log Family Income * New Bad Health in 1998 | | | | -0.049** | -0.049** |
| | | | | (0.015) | (0.015) |
| $R^2$ | 0.032 | 0.054 | 0.032 | 0.055 | 0.071 |
| # Observations | 13789 | 13789 | 13789 | 13789 | 13789 |

Notes: Standard errors are in parentheses. Dependent variable is whether the child is in poor health in 1998. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.

## Table 6 – Effects of Chronic Conditions on Test Scores
### a) Math Scores (Scaled)

| *Interactions with Income* | -1- | -2- | -3- | -4- | -5- |
|---|---|---|---|---|---|
| Chronic Condition in 1994 | 0.020** | | 0.121 | | 0.019** |
| | (0.010) | | (0.180) | | (0.010) |
| New Chronic Condition in 1998 | | 0.037** | | 0.166 | 0.169 |
| | | (0.011) | | (0.210) | (0.210) |
| Log of Average Income | -0.043** | -0.043** | -0.040** | -0.041** | -0.040** |
| | (0.009) | (0.009) | (0.010) | (0.010) | (0.010) |
| Mom High School or More | -0.034** | -0.034** | -0.034** | -0.034** | -0.035** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.010) |
| *Interactions* | | | | | |
| Log of Average Income * Chronic Condition in 1994 | | | -0.009 | | |
| | | | (0.017) | | |
| Log of Average Income * New Chronic Condition in 1998 | | | | -0.012 | -0.012 |
| | | | | (0.019) | (0.019) |
| $R^2$ | 0.540 | 0.541 | 0.540 | 0.541 | 0.541 |
| # Observations | 4823 | 4823 | 4823 | 4823 | 4823 |

| ***Interactions with Mom's Education*** | -6- | -7- | -8- |
|---|---|---|---|
| Chronic Condition in 1994 | 0.032** | | 0.019** |
| | (0.015) | | (0.010) |
| New Chronic Condition in 1998 | | 0.068** | 0.067** |
| | | (0.018) | (0.018) |
| Log of Average Income | -0.043** | -0.044** | -0.043** |
| | (0.009) | (0.009) | (0.009) |
| Mom High School Plus | -0.027** | -0.023** | -0.024** |
| | (0.011) | (0.010) | (0.010) |
| *Interactions* | | | |
| Mom High School Plus * Chronic Condition in 1994 | -0.020 | | |
| | (0.019) | | |
| Mom High School Plus * New Chronic Condition in 1998 | | -0.053** | -0.052** |
| | | (0.023) | (0.023) |
| $R^2$ | 0.540 | 0.541 | 0.542 |
| # Observations | 4823 | 4823 | 4823 |

Notes: Standard errors are in parentheses. Dependent variable is whether the child is in the lowest quintile of the test score distribution in 1998. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.

Table 6 – b) Reading Scores (Scaled)

| *Interactions with Income* | -1- | -2- | -3- | -4- | -5- |
|---|---|---|---|---|---|
| Chronic Condition in 1994 | 0.007 | | 0.039 | | 0.006 |
| | (0.011) | | (0.198) | | (0.011) |
| New Chronic Condition in 1998 | | | | | |
| | | 0.031** | | 0.456* | 0.457* |
| | | (0.013) | | (0.246) | (0.246) |
| Log of Average Income | -0.065** | -0.065** | -0.064** | -0.057** | -0.057** |
| | (0.011) | (0.011) | (0.013) | (0.012) | (0.012) |
| Mom High School or More | -0.067** | -0.068** | -0.067** | -0.068** | -0.068** |
| | (0.011) | (0.011) | (0.011) | (0.011) | (0.011) |
| *Interactions* | | | | | |
| Log of Average Income * Chronic Condition in 1994 | | | -0.003 | | |
| | | | (0.018) | | |
| Log of Average Income * New Chronic Condition in 1998 | | | | -0.040* | -0.040* |
| | | | | (0.023) | (0.023) |
| $R^2$ | 0.359 | 0.360 | 0.359 | 0.361 | 0.361 |
| # Observations | 4826 | 4826 | 4826 | 4826 | 4826 |

| ***Interactions with Mom's Education*** | -6- | -7- | -8- |
|---|---|---|---|
| Chronic Condition in 1994 | 0.0016 | | 0.006 |
| | (0.017) | | (0.011) |
| New Chronic Condition in 1998 | | | |
| | | 0.071** | 0.070** |
| | | (0.021) | (0.021) |
| Log of Average Income | -0.065** | -0.065** | -0.065** |
| | (0.011) | (0.011) | (0.011) |
| Mom High School Plus | -0.070** | -0.054** | -0.054** |
| | (0.013) | (0.012) | (0.012) |
| *Interactions* | | | |
| Mom High School Plus * Chronic Condition in 1994 | 0.009 | | |
| | (0.022) | | |
| Mom High School Plus * New Chronic Condition in 1998 | | -0.067** | -0.066** |
| | | (0.026) | (0.026) |
| $R^2$ | 0.359 | 0.361 | 0.361 |
| # Observations | 4826 | 4826 | 4826 |

Notes: Standard errors are in parentheses. Dependent variable is whether the child is in the lowest quintile of the test score distribution in 1998. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.

## Table 7 – Effects of Poor Health on Test Scores
### a) Math Scores (Scaled)

| *Interactions with Income* | -1- | -2- | -3- | -4- | -5- |
|---|---|---|---|---|---|
| Poor Health in 1994 | 0.038** | | 0.135 | | 0.038** |
| | (0.013) | | (0.247) | | (0.014) |
| Poor Health in 1998 | | 0.008 | | -0.016 | -0.018 |
| | | (0.013) | | (0.266) | (0.266) |
| Log of Average Income | -0.042** | -0.043** | -0.041** | -0.044** | -0.042** |
| | (0.009) | (0.009) | (0.010) | (0.010) | (0.010) |
| Mom High School or More | -0.032** | -0.033** | -0.032** | -0.033** | -0.032** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.010) |
| *Interactions* | | | | | |
| Log of Average Income * Poor Health in 1994 | | | -0.009 | | |
| | | | (0.023) | | |
| Log of Average Income * Poor Health in 1998 | | | | 0.002 | 0.002 |
| | | | | (0.025) | (0.025) |
| $R^2$ | 0.540 | 0.539 | 0.540 | 0.539 | 0.540 |
| # Observations | 4823 | 4823 | 4823 | 4823 | 4823 |

| *Interactions with Mom's Education* | -6- | -7- | -8- |
|---|---|---|---|
| Poor Health in 1994 | 0.041** | | 0.038** |
| | (0.019) | | (0.014) |
| Poor Health in 1998 | | 0.030 | 0.021 |
| | | (0.020) | (0.020) |
| Log of Average Income | -0.042** | -0.043** | -0.042** |
| | (0.009) | (0.009) | (0.009) |
| Mom High School Plus | -0.031** | -0.027** | -0.026** |
| | (0.010) | (0.010) | (0.010) |
| *Interactions* | | | |
| Mom High School Plus * Poor Health in 1994 | -0.007 | | |
| | (0.026) | | |
| Mom High School Plus * Poor Health in 1998 | | -0.044* | -0.046* |
| | | (0.026) | (0.026) |
| $R^2$ | 0.540 | 0.540 | 0.540 |
| # Observations | 4823 | 4823 | 4823 |

Notes: Standard errors are in parentheses. Dependent variable is whether the child is in the lowest quintile of the test score distribution in 1998. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.

Table 7 – b) Reading Scores (Scaled)

| *Interactions with Income* | -1- | -2- | -3- | -4- | -5- |
|---|---|---|---|---|---|
| Poor Health in 1994 | 0.052** | | -0.065 | | 0.044** |
| | (0.016) | | (0.269) | | (0.016) |
| Poor Health in 1998 | | 0.043** | | -0.158 | -0.160 |
| | | (0.017) | | (0.301) | (0.301) |
| Log of Average Income | -0.063** | -0.063** | -0.065** | -0.065** | -0.064** |
| | (0.011) | (0.011) | (0.012) | (0.012) | (0.012) |
| Mom High School or More | -0.065** | -0.066** | -0.065** | -0.066** | -0.064** |
| | (0.011) | (0.011) | (0.011) | (0.011) | (0.011) |
| *Interactions* | | | | | |
| Log of Average Income * Poor Health in 1994 | | | 0.011 | | |
| | | | (0.025) | | |
| Log of Average Income * Poor Health in 1998 | | | | 0.019 | 0.018 |
| | | | | (0.028) | (0.028) |
| $R^2$ | 0.361 | 0.360 | 0.361 | 0.360 | 0.362 |
| # Observations | 4826 | 4826 | 4826 | 4826 | 4826 |

| *Interactions with Mom's Education* | -6- | -7- | -8- |
|---|---|---|---|
| Poor Health in 1994 | 0.034 | | 0.044** |
| | (0.023) | | (0.016) |
| Poor Health in 1998 | | 0.042* | 0.032 |
| | | (0.024) | (0.024) |
| Log of Average Income | -0.063** | -0.063** | -0.062** |
| | (0.011) | (0.011) | (0.011) |
| Mom High School Plus | -0.070** | -0.066** | -0.064** |
| | (0.012) | (0.012) | (0.012) |
| *Interactions* | | | |
| Mom High School Plus * Poor Health in 1994 | 0.036 | | |
| | (0.032) | | |
| Mom High School Plus * Poor Health in 1998 | | 0.0017 | -0.000 |
| | | (0.033) | (0.033) |
| $R^2$ | 0.361 | 0.360 | 0.361 |
| # Observations | 4826 | 4826 | 4826 |

Notes: Standard errors are in parentheses. Dependent variable is whether the child is in the lowest quintile of the test score distribution in 1998. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.



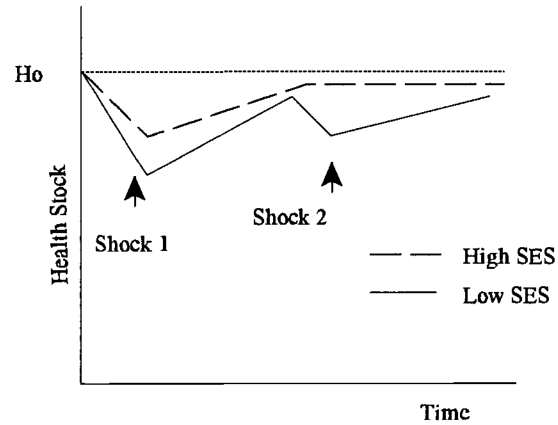
**Appendix Table 1: Comparing with Case, Lubotsky, and Paxson (2001)**

| Health Status Ordered Probits (1=excellent, 5=poor) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Case, Lubotsky, and Paxson (2001) | | | | Currie and Stabile (2002) | | | |
| Ages | 37258 | 37353 | 37510 | 37637 | 37258 | 37353 | 37510 | 37635 |
| # Observations | 51448 | 54067 | 64746 | 59069 | 8961 | 17260 | 10446 | 3507 |
| ***Without Mom's Education*** | | | | | | | | |
| Log of Average Income | -0.183** | -0.244** | -0.286** | -0.323** | -0.151** | -0.216** | -0.259** | -0.272** |
| | -0.01 | -0.01 | -0.008 | -0.008 | -0.026 | -0.019 | -0.024 | -0.04 |
| ***With Mom's Education*** | | | | | | | | |
| Log of Average Income | -0.114** | -0.156** | -0.187** | -0.218** | -0.132** | -0.182** | -0.215** | -0.254** |
| | -0.01 | -0.01 | -0.008 | -0.009 | -0.027 | -0.02 | -0.025 | -0.041 |
| Mom's Education= 12 Years | -0.136** | -0.169** | -0.170** | -0.170** | | | | |
| | -0.018 | -0.018 | -0.017 | -0.017 | | | | |
| Mom's Education>12 Years | -0.244** | -0.322** | -0.336** | -0.319** | | | | |
| | -0.021 | -0.02 | -0.019 | -0.019 | | | | |
| Mom High School or More | | | | | -0.073** | -0.135** | -0.163** | -0.067 |
| | | | | | -0.031 | -0.022 | -0.028 | -0.046 |

Notes on Currie and Stabile regressions: Standard errors are in parentheses. Other variables included in the regressions are: log of family size, dummy variables for single age, sex, a dummy indicating that the PMK is not the biological mother, a dummy indicating that the PMK is female, a dummy indicating that the child belongs to a two parent household, mother's age at the birth of the child and an indicator for the method of imputation for income used. * denotes the coefficient is significant at the 10% level. ** denotes the coefficient is significant at the 5% level.

For details of the specifications for the Case, Lubotsky and Paxson results, please see Case, Lubotsky and Paxson (2001) Table 2.

Figure 1: Changes in the Health Stock Over Time by SES



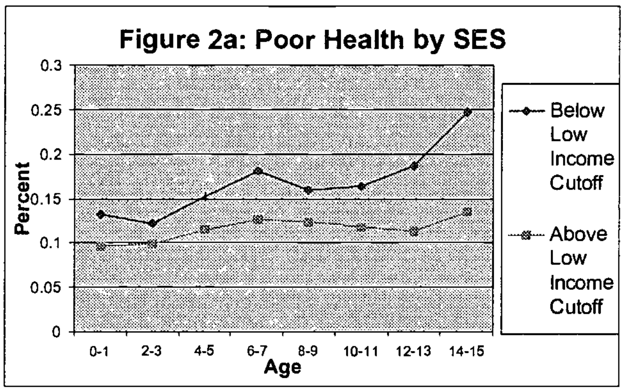


Figure 2a: Poor Health by SES
0.3
0.25
0.2
0.15
0.1
0.05
0
Percent
0-1
2-3
4-5
6-7
8-9
10-11
12-13
14-15
Age
Below Low Income Cutoff
Above Low Income Cutoff

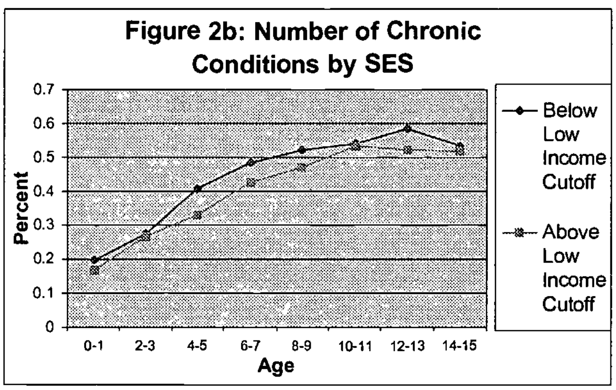


Figure 2b: Number of Chronic Conditions by SES
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Percent
0-1
2-3
4-5
6-7
8-9
10-11
12-13
14-15
Age
Below Low Income Cutoff
Above Low Income Cutoff

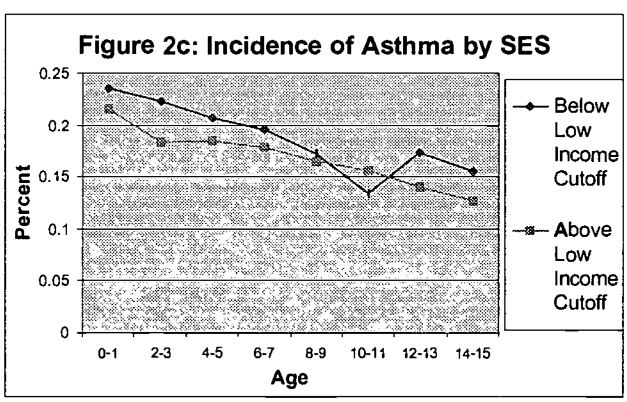


Figure 2c: Incidence of Asthma by SES
0.25
0.2
0.15
0.1
0.05
0
Percent
0-1
2-3
4-5
6-7
8-9
10-11
12-13
14-15
Age
Below Low Income Cutoff
Above Low Income Cutoff

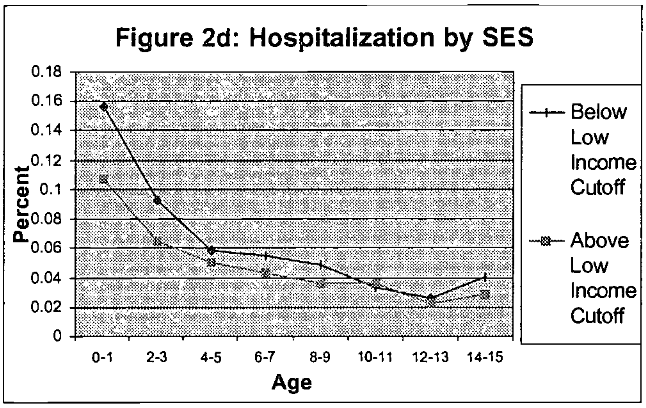


Figure 2d: Hospitalization by SES

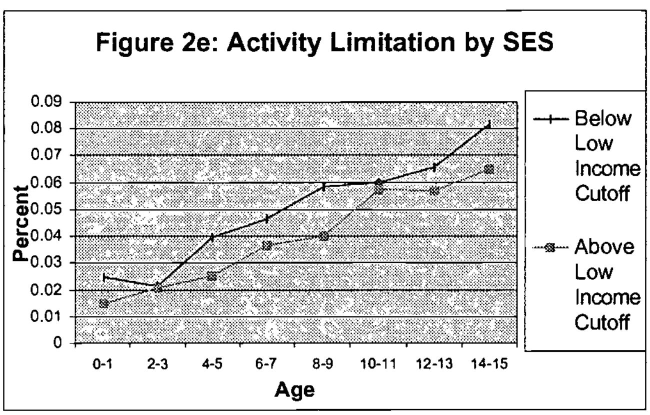


Figure 2e: Activity Limitation by SES

Notes: Graphs report the percent of children in each age group with the given condition. The low-income cutoff is calculated by Statistics Canada and is based on income, location of residence, and family composition.

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