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Childhood Health and Labor Market Inequality over the Life Course

Steven A. Haas[1], M. Maria Glymour[2], and Lisa F. Berkman[2]

Abstract

The authors use data from the Health and Retirement Study's Earnings Benefit File, which links Health and Retirement Study to Social Security Administration records, to estimate the impact of childhood health on earnings curves between the ages of 25 and 50 years. They also investigate the extent to which diminished educational attainment, earlier onset of chronic health conditions, and labor force participation mediate this relationship. Those who experience poor childhood health have substantially diminished labor market earnings over the work career. For men, earnings differentials grow larger over the early to middle career and then slow down and begin to converge as they near 50 years of age. For women, earnings differentials emerge later in the career and show no evidence of convergence. Part of the child health earnings differential is accounted for by selection into diminished educational attainment, the earlier onset of chronic disease in adulthood, and, particularly for men, labor force participation.

Keywords

childhood health, disparities, earnings, health selection, HRS

In this study, we investigate the role of childhood health in the process of social stratification by estimating the extent to which poor childhood health has a lasting impact on adult labor market outcomes. Using a unique combination of prospective and retrospective data from the Health and Retirement Study (HRS), we investigate how the impact of poor childhood health unfolds over the life course by modeling differences in life cycle earnings profiles by childhood health status. We then test if differences in earnings profiles result from selection into lower educational strata, the early onset of chronic health problems, and selection out of the labor market.

BACKGROUND

Health Selection

The notion that childhood health may affect adult labor market trajectories derives from the health selection hypothesis. This hypothesis posits that at least part of the well-established association between socioeconomic status (SES) and health results from social processes by which poor health has adverse causal effects on socioeconomic position.[1] Researchers have offered two processes by which adverse health events may exert negative impacts on socioeconomic position. In the first, *socioeconomic drift*, adults in poor health are selected into lower SES because of decreased labor force participation, thereby decreasing wage income and inhibiting wealth accumulation. Furthermore, health problems

[1]Arizona State University, Tempe, AZ, USA
[2]Harvard University, Cambridge, MA, USA

Corresponding Author:
Steven A. Haas, Arizona State University, School of Social and Family Dynamics, P.O. Box 873701, Tempe, AZ 85287-3701, USA
E-mail: steven.haas@asu.edu

may necessitate spending previously accumulated assets either to replace lost income or to pay for health services. The second process, *social stunting*, posits that poor health, particularly during critical or sensitive periods of childhood and adolescence, may limit an individual's initial accumulation of human capital (both cognitive and noncognitive) and subsequent ascent to higher positions of prestige, power, and wealth. Thus, health selection may operate in two distinct ways: either by inducing downward social mobility or by preventing movement upward.

Previous research lends some empirical support to both variants of the health selection hypothesis. Economists have presented evidence of socioeconomic drift, demonstrating substantial adverse effects of poor adult health on wages, labor force participation, and ultimately earnings (Chirikos and Nestel 1985). Recent studies have estimated the impact of later life health shocks in the form of chronic disease onset on labor force participation, earned income, and wealth (Smith 1999, 2005).

In the past decade, a handful of studies have investigated the social stunting variant (Case, Fertig, and Paxson 2005; Conley and Bennett 2000; Palloni 2006). With regard to labor market outcomes, Black, Devereux, and Salvanes (2005) compared the birth weight and earnings of Norwegian twins and found that a 10 percent increase in birth weight was associated with a 1 percent increase in earnings. Haas (2006) showed that relative to their peers in excellent health, those who experienced poor childhood health had 22 percent lower earnings in middle age. Similarly, Johnson and Schoeni (2007) found that low birth weight reduced labor force participation rates by 5 percent and earnings by 10 percent at age 25 and 15 percent at age 35.

An important limitation of previous work on this topic is that it has tended to focus on the impact of health at one point in time, usually at early adulthood or midlife or within a narrow range of the work career. Such studies can provide empirical snapshots of selection effects at various points in adulthood but cannot illuminate how health affects trajectories of socioeconomic attainment over the life course. Does poor childhood health lead to a consistent deficit in adult socioeconomic attainment, or does its effect increase or decrease in magnitude over the life course? To what extent does childhood health influence the underlying level and shape of life cycle earnings trajectories over the core working years? No previous study has addressed this issue.

Failure to investigate these issues over the work career also means that studies have tended to examine either socioeconomic drift or social stunting without considering the relative importance of each over the life course or the theoretical or empirical linkages connecting them. Studies of the effect of health on earnings have focused on proximal health status and thus labor supply as the principal causal mechanism. However, this obscures the potentially important role of childhood health, which may have lasting effects on earnings net of employment if it permanently alters health-related productivity or selects individuals into lower educational strata. In their totality, the studies discussed above suggest that early life health insults can have lasting impacts on labor market outcomes over the work career. However, no previous research has investigated the impact of childhood health on age-earnings profiles, and thus very little is known about the long-term contours of this relationship or the mechanisms through which they emerge.

Theoretical Pathways Linking Childhood Health to Labor Market Outcomes

There are a number of pathways through which poor health in early life may be expected to have lasting impacts on labor market success. Two that are immediately important are educational attainment and adult health status. There is growing evidence as to the role played by health in determining educational outcomes. For example, poor health in childhood has been linked to diminished cognitive development and academic achievement (Boardman et al. 2002; Currie and Stabile 2004), and such insults are ultimately associated with lower levels of completed schooling (Case et al. 2005; Haas 2006; Haas and Fosse 2008) and impaired occupational attainment (Case et al. 2005; Haas 2006). In addition, early life insults may alter one's preferences vis-à-vis time horizons and investments in human capital. For example, serious illness in childhood may lead individuals to value the maximization of near-term gains at the expense of investments in human capital that may pay off over the long term. Given education's central role as a determinant of labor market outcomes, to the extent that poor early life health is associated with diminished educational attainment, it should be expected to negatively affect age-earnings profiles. This is consistent with the social stunting variant of health selection.

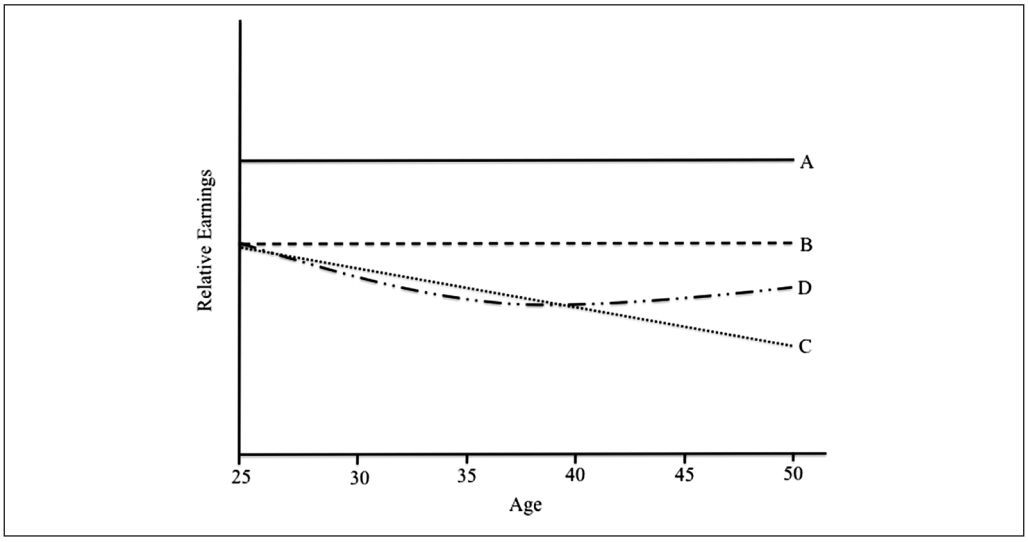

Figure 1. Hypothesized Effects of Poor Childhood Health on Age-Earnings Profiles

A second pathway by which childhood health may influence labor market outcomes is through differential onset of health problems in adulthood. A growing body of research has documented that poor health in childhood is associated with increased risk for poor adult health outcomes (Barker 1994; Blackwell, Hayward, and Crimmins 2001; Haas 2007, 2008). Therefore, consistent with socioeconomic drift, early life health insults may matter because they increase the risk for poor health in adulthood, negatively affecting earnings.

Hypothesized Effects of Childhood Health on Age-Earnings Profiles

The standard model of age-earnings profiles derives from human capital theory (Mincer 1974), whereby earnings (often log transformed) increase as a function of labor market experience (with age frequently acting as a proxy for experience). This canonical specification uses a quadratic functional form such that beginning with labor market entry, earnings grow throughout the early and middle career, typically peak in the 50s, and then decline as retirement nears. Investments in human capital, such as education, increase the rate of growth in earnings in the early and middle career, leading to increased earnings disparities (Murphy and Welch 1990). However, educational differentials tend to decline slightly as retirement nears, because of the diminished returns to increasingly outdated skills among more educated workers (Neuman and Weiss 1995).

Figure 1 presents three alternate scenarios by which the effect of childhood health on earnings may be expected to vary over the work career (i.e., alter the level and shape of age-earnings profiles). Horizontal line A represents the level of earnings of those who experience healthy childhoods (fixed as a reference group). Lines B to D represent alternative hypotheses about the age-related deficit associated with experiencing poor childhood health. Line B represents the naive *constant deficit hypothesis*. Under scenario B, poor childhood health is hypothesized to result in an earnings deficit that remains constant over the work career, thus shifting the age-earnings profile downward but not affecting its shape.

Line C represents the *cumulative disadvantage hypothesis*. Under scenario C, those who experience healthy childhoods are able to translate their initial physical productive advantage into additional opportunities for promotion, job advancement, and higher earnings, for example through greater accumulation of education and other forms of human capital and psychosocial resources (Ross and Wu 1996). Thus, early career advantage begets even greater advantages later in the work career, leading to increased heterogeneity in earnings at older ages. Therefore, under scenario C, poor childhood health is hypothesized to result in a slower rate of growth in earnings relative to healthy peers, thus yielding both a different level and shape to the

age-earnings profile. The findings of Johnson and Schoeni (2007) lend tentative support to scenario C. They observed that the earnings deficit from low birth weight increased from 10 percent to 15 percent between 25 and 35 years of age.

Line D, the *life cycle variation hypothesis*, posits that the earnings differential associated with poor childhood health varies over the life cycle. Specifically, in the early career, those who had poor childhood health are hypothesized to experience increasing earnings deficits relative to their healthy peers. However, in the middle and late career stages, these deficits become increasingly muted. There are two reasons to hypothesize a decline in earnings deficits in the later career. First, if earnings deficits are themselves a function of early and ongoing poor health, then as members of the cohort age and the onset of chronic health conditions becomes an increasingly common experience, the disadvantage associated with poor childhood health may diminish. Eventually everyone's health declines. As the cohort experiences declining heterogeneity in morbidity, the relative disadvantage of poor health early in life may fade. Second, to the extent that earnings differentials are driven by selection into lower educational strata, we would expect that the value of additional schooling by the healthier members of the cohort would decline as the vintage of their additional schooling becomes less valuable over time (Neuman and Weiss 1995).

The Present Study

The present study makes a number of important contributions to the understanding of the role of health in the stratification process. We are the first to derive theoretically and empirically based alternative hypotheses about how the earnings disparity associated with poor childhood health may vary over the work career. Second, we are able to test which of the hypothesized scenarios described above is most consistent with the experience of a large population-based sample of Americans. A central reason for the dearth of studies investigating health selection over the life course is the lack of high-quality data connecting childhood health status to labor market outcomes observed over the work career. Whereas previous investigations have looked at a single point in adulthood or at narrow periods of the early career, in the present study, we take advantage of a unique combination of prospective and retrospective data from the HRS to estimate the effect of childhood health on age-earnings profiles over the core working years. The present study also provides insight into the relative contribution of social stunting and socioeconomic drift by investigating the extent to which the impact of poor childhood health acts indirectly through educational attainment, the differential onset of chronic disease, and selection out of the labor market.

METHODS

Data

We use data drawn from the Earnings Benefit File (EBF) of the HRS (Mitchell, Olson, and Steinmeier 1996). Begun in 1992 the HRS is a long-term panel study of Americans born from 1931 to 1941 and combines extensive information on both socioeconomic and health status (Juster and Suzman 1995). Initial data collection took place using in-home interviews, with follow-up every second year via telephone. Approximately 9,500 age-eligible respondents constituted the original HRS sample. At the initial interview, respondents were asked permission to access their Social Security Administration (SSA) records. While 75 percent of the sample consented, ultimately 66 percent of the sample was successfully linked to their SSA records.[2] The EBF includes SSA records of yearly earnings from 1951 to 1991. The analysis below is restricted to the 6,155 respondents who were successfully linked and who additionally survived and were included in the 1998 wave as this was when childhood health status was assessed.

Measures

Labor market outcomes. We examine annual inflation-adjusted earnings (1992 dollars) at ages 25 to 50. For each respondent, we have 26 yearly earnings observations, yielding 166,608 annual earnings records. We have decided not to use a log transformation, because earnings drawn from SSA records are top coded because of the tax cap. There is thus substantially less rightward skew to the earnings distribution than is typical, obviating the primary motivation for the transformation. The age

range of 25 to 50 years was chosen for several reasons. Substantively, this represents the core of the economically active years. Starting at age 25 minimizes the influence of left censoring due to those who had not completed schooling. Age 50 was chosen to avoid the issue of retirement (right censoring) as much as possible. From a practical standpoint, these were the ages for which full SSA data were available for all the HRS birth cohorts.

Childhood health. In 1998, respondents were asked to "consider your health while you were growing up, from birth to age 16. Would you say that your health during that time was excellent, very good, good, fair, or poor?" We create a dichotomous measure of childhood health disadvantage that codes those who report experiencing fair or poor childhood health as 1 and those reporting good, very good, or excellent childhood health as 0. Previous research has analyzed the quality of retrospective reports of overall subjective childhood health in large nationally representative samples (Haas 2007; Haas and Bishop 2010; Smith 2009). This work demonstrates that retrospective measure of overall childhood health is reliably reported over time and is strongly associated with low birth weight and a wide variety of common childhood conditions and activity limitations.

Mediators of the impact of child health on labor market outcomes. Educational attainment is measured as years of completed schooling. In addition, at wave 1, HRS respondents were asked if a doctor had ever diagnosed them with various chronic health conditions, including heart disease, cancer, diabetes, and stroke. If they answered affirmatively, they were asked the year of diagnosis. For each annual observation of earnings, we include a dummy variable indicating if the respondent had been diagnosed with any condition prior to that year's observation.

All models adjust for race (with white as the referent), ethnicity (with non-Hispanic as the referent), parental education (mean-centered years of schooling), and father's occupation using the following categories: professional or managerial (referent), sales or clerical, skilled laborer (protection service, mechanics and repair, construction trade, precision production), unskilled or service (private household, cleaning, food preparation, health and personal services, machine, transport operators), military, farming, and missing. Descriptive statistics for variables used in the analysis are presented in Table 1.

Analysis

The analysis proceeds in three steps. First, we estimate age-earnings profiles using a random-effects model for a continuous outcome, specified as

$$Y_{it} = \mathbf{X}\beta + \mathbf{Z}\gamma + u_i + e_{it},$$

where earnings for individual i at time $t(Y_{it})$ is a function of time-invariant ($\mathbf{X}$) and time-varying ($\mathbf{Z}$) covariates, a normally distributed individual random effect (u_i), and an individual time-specific error term (e_{it}) which is assumed ~$N(0, 1)$. Estimation was accomplished using generalized least squares in the xtreg Stata command. Results are based on a smoothed polynomial functional form for age-earnings profiles.[3] A quadratic specification of experience (age) is the canonical model used to estimate age-earnings profiles. Likewise, we include a centered measure of age and a quadratic age term such that a value of age = 0 corresponds to age 25, a value of 1 corresponds to age 26, and so on. Therefore, the main effect of the childhood health variable represents the impact of experiencing poor childhood health on earnings at the intercept (age 25). Interaction terms between poor childhood health and age and the quadratic age term are used to test how the impact of poor childhood health on age-earnings profiles varies over the work career. Different patterns of significant main and interaction effects provide support for the three alternative hypotheses described above. Evidence for the *constant deficit hypothesis* would be a significant negative main effect of poor childhood health combined with the absence of significant first- or second-order interactions between childhood health and age. Key evidence for the *cumulative disadvantage hypothesis* would be a significant negative first-order interaction between poor childhood health and age combined with the absence of a significant second-order interaction (most likely combined with a significant negative main effect of poor childhood health). Key evidence for the *life cycle variation hypothesis* would be a significant negative first-order and a significant positive second-order interaction between poor childhood health and age. A

Table 1. Descriptive Statistics, Health and Retirement Study

Variable	Percent	Mean	Standard Deviation
Fair or poor childhood health	7.0		
Annual earnings (1992 dollars)		14682	11750
Mother's education (centered)		.39	3.38
Mother's education missing	7.8		
Father's education (centered)		.04	3.67
Father's education missing	11.0		
Father's occupation			
professional or managerial	12.5		
sales or clerical	8.4		
skilled manual	19.6		
unskilled manual or service	22.3		
farm	21.4		
millitary	.8		
missing	15.7		
Black	15.7		
Hispanic	7.5		
Female	53.4		
Birth year		1936.3	3.16
Education (years)		12.2	3.1
Onset of chronic disease < age 30	.6		
Onset of chronic disease < age 40	1.3		
Onset of chronic disease < age 50	3.9		
N		6155	

significant negative second-order interaction implies at the very least a slowing down in the growth of the earnings disparity at later ages and, depending on its strength, movement toward convergence.

Next, we investigate the extent to which the impact of childhood health is indirect, working through selection into lower educational strata and through earlier onset in chronic disease. This is accomplished by estimating models in which we add controls for educational attainment and prior onset of chronic disease, respectively. Because the labor market experiences of men and women are not comparable, especially among these cohorts, all models are estimated separately by gender.[4]

Finally, we investigate the extent to which earnings differentials result from differences in employment or earnings conditional on employment. To examine this question, we estimate models in which we condition on employment by dropping those age-year observations in which the respondent had zero earnings. To the extent that the estimated impact of poor childhood health is acting via selection out of the labor market, we would expect the predicted earnings differentials to be smaller in models excluding zero observations.[5]

RESULTS

Differentials in Age-Earnings Profiles by Childhood Health

Table 2 presents estimates from the random-effects model of earnings including zeros. The first four columns present results for men. As seen, in model 1, the main effect of poor childhood health (deficit at age 25) for men is a positive $963. However, this was not statistically significant, suggesting that at age 25, there was not a significant earnings differential associated with poor childhood health. However, there is a large negative interaction between poor childhood health and age and a significant positive interaction between childhood health and the square of age. To see how the effect of poor childhood health on men's earnings unfolds over the work career, Figure 2 presents

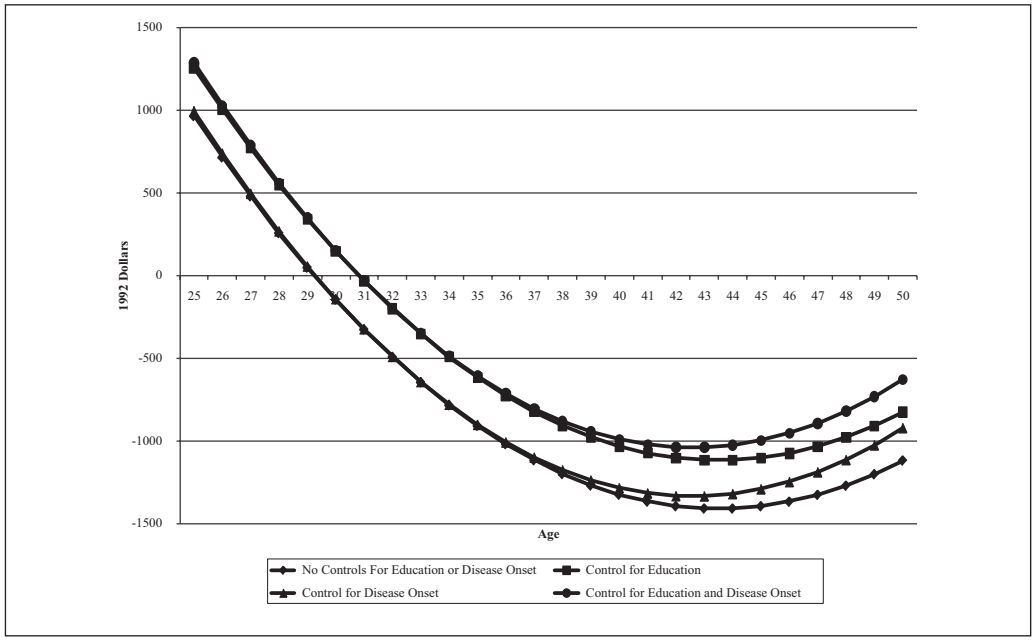

Figure 2. Predicted Earnings Differential Associated with Poor Childhood Health (Men)

model-based predictions of the age-specific earnings differentials associated with poor childhood health. The line with solid diamond markers presents predictions on the basis of model 1, which do not adjust for educational attainment and prior onset of chronic disease. During the first half of their careers (prior to age 40), men with unhealthy childhoods typically experience declining earnings relative to their healthy peers. During the 30s, the earnings deficit experienced by men with unhealthy childhoods expands, reaching more than $1,400 per year by age 40. The deficit then attenuates modestly in the late 40s. Thus, the shape of the earnings deficit over the work career is most consistent with scenario D, the life cycle variation hypothesis. Cumulatively, over the course of the 26 years, men who experienced fair or poor childhood health earned approximately $20,033 less in constant 1992 dollars than their peers who experienced better health in early life.

There are strong gender differences in the patterns of life cycle earnings differentials by childhood health. Formal tests of gender differences in the effect of poor childhood health revealed significant gender differences in the main effect, the linear age term, and the quadratic age term. The last four columns of Table 2 present results for women. In model 1, there is a negative main effect of being in fair or poor childhood health such that at age 25, women with unhealthy childhoods earned on average $1,030 less than their healthy childhood peers. However, as with men, this early deficit is not significant, suggesting that there were not substantial earnings differentials at age 25. As with men, there are also significant interaction effects between poor childhood health and the linear and quadratic age terms. However, the nature of these interactions is quite different. Figure 3 presents predicted age-specific earnings differentials associated with fair or poor childhood health for women. As can be seen from the solid diamond line (model 1), the earnings deficit for women does not begin to appear until the midcareer (around age 40), after which it continues to expand. Unlike men, the childhood health–related earnings differential shows no signs of attenuation in the later career. The shape of the earnings differential for women is consistent with a delayed form of the *cumulative disadvantage hypothesis* (scenario C). This delay may result from the fact

Table 2. Random-Effects Model of Annual Earnings with Zeros (Health and Retirement Study)

	Men				Women			
Variable	1	2	3	4	1	2	3	4
Poor childhood health	963.61	1,254.12	991.42	1,284.48	−1,030.43	−730.89	−991.30	−692.90
	[890.13]	[885.24]	[889.05]	[884.02]	[532.61]	[522.26]	[532.45]	[522.16]
Age	1,109.84***	1,109.84***	1,097.54***	1,097.51***	333.04***	333.04***	330.78***	330.80***
	[17.09]	[17.09]	[17.09]	[17.09]	[12.14]	[12.14]	[12.13]	[12.13]
Age^2	−25.35***	−25.35***	−24.24***	−24.24***	.74	.74	1.12*	1.12*
	[.66]	[.66]	[.66]	[.66]	[.47]	[.47]	[.47]	[.47]
Poor Childhood Health × Age	−256.54***	−256.54***	−264.55***	−264.57***	169.48***	169.48***	166.40***	166.41***
	[71.27]	[71.27]	[71.18]	[71.18]	[42.90]	[42.90]	[42.88]	[42.88]
Poor Childhood Health × Age^2	6.93*	6.93*	7.52*	7.52*	−8.83***	−8.83***	−8.55***	−8.56***
	[2.75]	[2.75]	[2.75]	[2.75]	[1.66]	[1.66]	[1.66]	[1.66]
Education		484.01***		488.15***		736.68***		734.44***
		[70.74]		[70.64]		[57.01]		[57.00]
Prior disease onset			−3,132.51***	−3,139.29***			−1,480.32***	−1,471.91***
			[224.06]	[224.02]			[152.92]	[152.77]
R^2 within	.159	.159	.162	.162	.140	.140	.141	.141
R^2 between	.110	.124	.112	.127	.032	.079	.033	.080
R^2 total	.131	.139	.134	.142	.081	.107	.082	.108
n (groups)	74,620 (2,870)	74,620 (2,870)	74,620 (2,870)	74,620 (2,870)	85,410 (3,285)	85,410 (3,285)	85,410 (3,285)	85,410 (3,285)

Note: All models adjust for parental education, father's occupation, and race and ethnicity. Values in square brackets are standard errors.
*$p < .05$. **$p < .01$. ***$p < .001$ (two-tailed tests).

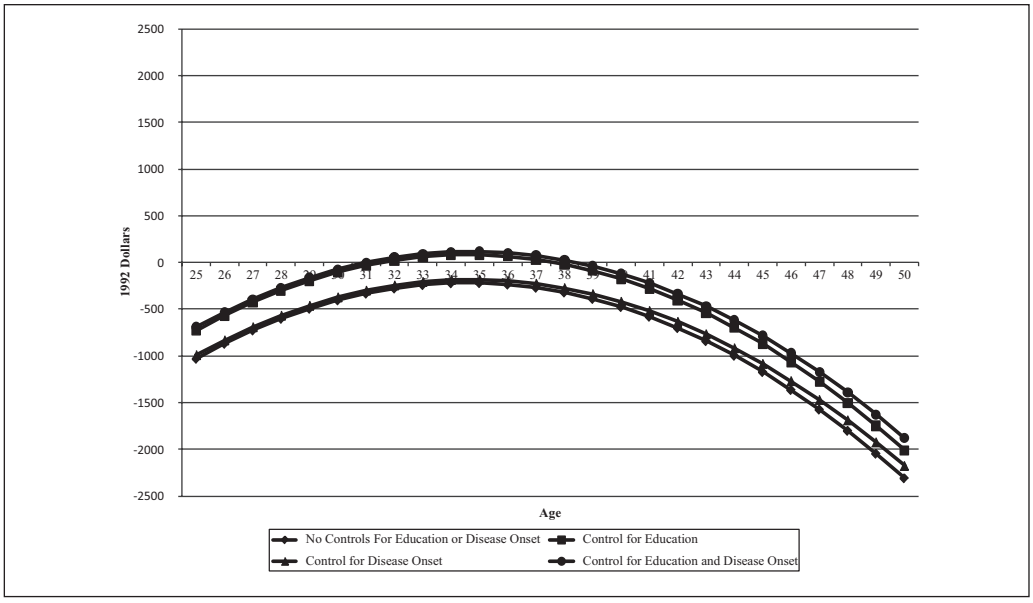

Figure 3. Predicted Earnings Differential Associated with Poor Childhood Health (Women)

that women in the cohort had very low rates of labor force participation prior to age 40. However, despite the fact that women in these cohorts had markedly lower overall levels of employment and earnings than their male counterparts, the cumulative earnings deficit for those experiencing poor childhood health was slightly larger among women than it was among men ($20,494 in constant 1992 dollars). This suggests that once employment becomes more common among women, the impact of poor childhood health may be a more important predictor of earnings than among men. Unlike the men, sick women's later career earnings deficit was not offset by possible early career earnings advantages.

The Mediating Effects of Educational Attainment and Onset of Chronic Disease

To test whether the observed earnings differentials associated with fair or poor childhood health are mediated by educational attainment and onset of chronic disease, we estimated a series of nested models. The results of this analysis are presented in models 2 to 4 in Table 2. Predicted earnings differentials from these different models are presented in Figures 2 (men) and 3 (women). For men, adjusting for education increases the main effect of fair or poor childhood health by about one third. However, this is still not statistically significant. Each additional year of schooling increases earnings by $484 and $736 for men and women, respectively. The interactions between childhood health and age remain unchanged by the addition of education to the model. Similar results are found for women. For both men and women, the effect of controlling for education is to shift the curves up, attenuating the annual effect of poor childhood health by about one third. However, it does not alter the shape of the curves.

Model 3 includes a control for whether the respondent experienced the prior onset of a chronic disease. There is a significant and large effect of prior disease onset on earnings. Each additional chronic disease reduces subsequent earnings by $3,132 per year for men and $1,480 per year for women. However, chronic disease onset explains only a small portion of the earnings gap associated with poor childhood health. The main effect of poor childhood health and the child health by age interaction terms change only slightly. However, it does alter the age interaction terms. The impact of chronic disease onset largely emerges after age 40, acting to attenuate the earnings disparity. Model 4 includes both educational attainment and onset of chronic disease. This model also reveals that

education and premature disease onset play a substantial role in mediating the impact of poor childhood health on earnings curves. However, large and significant disparities still exist for both men and women net of these factors.

Earnings Differentials Conditional on Employment

Table 3 presents estimates of age-earnings curves conditional on employment (excluding zero-year observations). If poor childhood health were reducing earnings through selecting individuals out of the labor market, we would expect that the impact of poor childhood health would be reduced in models in which the zero observations were dropped. For men, conditional on employment, the estimated impact of poor childhood health is indeed substantially reduced relative to models in which zeros are included. On the basis of model 1, by the last 5 years of observation, the annual predicted earnings disparity is 30 percent to 40 percent smaller in models without zeros. In the full model (model 4), the predicted disparity at age 50 is almost completely eliminated. However, the overall life course pattern remains. The cumulative impact of poor childhood health on earnings over the work career is reduced by about one third for men ($13,000 vs. $20,000). This suggests that for men a substantial portion of the earnings differential associated with poor childhood health is working through selection out of the labor market. For women, conditioning on employment also substantially increases the early career impact of poor childhood health while attenuating its impact in subsequent years. For women, the cumulative effect of poor childhood health on career earnings is reduced by approximately 15 percent once the impact of employment selection has been parceled out. Overall, health-related selection out of the labor market appears to play a smaller role for women than for men. Finally, the effect of poor childhood health at age 25 (main effect) was statistically significant in models excluding zero earnings years.

DISCUSSION

The current analysis provides a substantial extension and elaboration of the growing literature documenting the influence of childhood health on the process of socioeconomic attainment. Specifically, we take advantage of unique administrative record-linked survey data to provide the first analysis of the impact of childhood health on life cycle labor market outcomes. We further estimate the extent to which such differences derive from health-related selection into lower educational strata, earlier onset of chronic health conditions, and labor market participation.

The results of the present study are consistent with previous research that has shown that early life health has a negative impact on labor market outcomes (Black et al. 2005; Case et al. 2005; Haas 2006; Johnson and Schoeni 2007). However, the current analysis extends that literature by additionally showing that disparities in earnings are not consistent over the work career. For men, earnings disparities emerge relatively early in the work career and expand throughout the middle working years. However, there is clear evidence that as men approach age 50, those disparities have begun slowing down and are even beginning to narrow. That pattern is most consistent with the *life cycle variation hypothesis* (scenario D), which hypothesized an early expansion of health-related earnings inequality that attenuated in the later working years. Although the model estimates suggest a possible earnings advantage for those with poor childhood health early in the career, it is important to point out that the main effect (disparity at age 25) was not statistically significant. Thus, an early career advantage is purely speculative. One possible explanation for this is that less healthy individuals may be accumulating labor market experience while their healthier counterparts remain in school. This can yield an early career advantage that eventually fades as their healthier and more educated peers surpass them.

Previous research by Johnson and Schoeni (2007) found that earnings disparities associated with low birth weight expanded between ages 25 and 35. Our analysis extends the observed period of the work career by 15 years. Our findings from ages 25 to 35 are largely consistent with those of Johnson and Schoeni. However, our analysis suggests that for men, childhood health–related earnings disparities continue to expand after age 35, peak in the early 40s, and begin to narrow as workers near age 50.

Table 3. Random-Effects Model of Annual Earnings without Zeros (Health and Retirement Study)

	Men				Women			
Variable	1	2	3	4	1	2	3	4
Poor Childhood Health	911.85	1,267.28	941.81	1,299.69	−1,451.03*	−1,127.77	−1,449.17*	−1,126.41
	[750.88]	[340.35]	[750.85]	[740.25]	[591.51]	[578.49]	[591.39]	[578.43]
Age	1,146.23***	1,146.63***	1,139.22***	1,139.57***	401.05***	402.24***	400.01***	401.23***
	[16.03]	[16.03]	[16.04]	[16.04]	[16.79]	[16.78]	[16.79]	[16.04]
Age^2	−22.09***	−22.10***	−21.43***	−21.43***	.49	.44	.65	.58
	[.62]	[.62]	[.62]	[.62]	[.63]	[.63]	[.63]	[.63]
Poor Childhood Health × Age	−223.18***	−221.56***	−230.59***	−229.00***	223.98***	225.15***	225.16***	226.29***
	[67.08]	[67.08]	[67.04]	[67.04]	[62.05]	[62.02]	[62.04]	[62.01]
Poor Childhood Health × Age^2	6.44*	6.38*	6.87**	6.82**	−9.37***	−9.41***	−9.35***	9.39***
	[2.61]	[2.61]	[2.61]	[2.61]	[2.31]	[2.31]	[2.31]	[2.31]
Education		597.42***		601.20***		874.19***		872.91***
		[58.07]		[58.07]		[56.30]		[56.29]
Prior disease onset			−2,078.04***	−2,092.36***			−628.18**	−604.16**
			[219.11]	[218.98]			[207.58]	[206.96]
R^2 within	.261	.261	.262	.262	.174	.159	.174	.174
R^2 between	.197	.223	.197	.223	.027	.124	.027	.079
R^2 total	.216	.235	.217	.236	.091	.139	.091	.136
n (groups)	65,297 (2,870)	65,297 (2,870)	65,297 (2,870)	65,297 (2,870)	49,556 (3,285)	49,556 (3,285)	49,556 (3,285)	49,556 (3,285)

Note: All models adjust for parental education, father's occupation, and race and ethnicity. Values in square brackets are standard errors.
*$p < .05$. **$p < .01$. ***$p < .001$ (two-tailed tests).

For women, the observed pattern is very different. As seen in the predicted earnings differentials presented in Figure 3, the earnings differential associated with poor childhood health does not appear to emerge until much later in the work career (after age 40) and then continues to expand. This is more consistent with a delayed version of the *cumulative disadvantage hypothesis* (scenario C). The later emergence of disadvantage is consistent with relatively low rates of labor force participation by women early in the career. Thus, in later years, as women increasingly enter paid employment, the labor market becomes an increasingly important locus of socioeconomic differentiation. There is also some evidence of a possible early career disparity among women. However, this is statistically significant only when conditional on having any earnings. Although caution is warranted, the observed declining impact of poor health in the early career may reflect the increasingly select nature of labor force participation of healthy women at this stage of the life course. Thus, unhealthy women may earn less at both the early and late career because it is at those ages that labor force participation among women is greatest, and therefore they are likely to face the greatest competition from their healthier peers.

For women, the picture is further embedded within the process of family formation and the timing of entry into marriage, which has very strong impacts on women's labor force participation. As the mothers of the baby boom, such processes were especially salient for women in these cohorts. For the average woman in our sample, the baseline observation (age 25) occurred in 1961, around the time when period fertility rates associated with the baby boom peaked. On the basis of data from the EBF, it has been shown that married women in these cohorts had on average 2.8 fewer years of SSA covered employment between the ages of 20 and 50 than unmarried women (Mitchell et al. 1996). Accordingly, they spent a smaller proportion of their 20s and 30s in covered employment compared with unmarried women. Interestingly, in separate analysis not shown, we find that on average, women who experienced fair or poor childhood health entered their first marriage about 7 months earlier than their peers who experienced excellent childhood health. They also had a slightly higher number of children ever born. However, because a very similar pattern was found even after conditioning on employment (having positive earnings), it is likely that only a small part of the early career differential in earnings can be accounted for by these differences in family formation and their resulting labor market selection.

Although formal tests demonstrate that the observed gender differences in the central parameters of interest were indeed significant, we would caution against possibly overstating the differences between men and women. First, the low rates of labor force participation among women make the earnings data relatively sparse, especially in the early career. This can make estimates more sensitive to model specification. Second, the labor market experience of this particular cohort of women represents an important transition. Not only were many of these women the mothers of the baby boomers, but they also contributed heavily to the large influx of women into the labor market in the 1970s. For that reason, they represent a transitional cohort for women's social and economic roles. More recent cohorts of women who have attained much higher levels of educational attainment and have a greater attachment to the labor market early in the work career and during the childbearing years may have patterns that more closely resemble those of men.

Conditional on employment in a given year (i.e., having positive earnings), we again find that those who experience poor childhood health have substantially diminished labor market earnings. The fact that similar patterns and size of parameters estimates are found in models with and without zero earnings suggests that health-related selection into employment is important but is not the central explanation for childhood health-related earnings disparities. Poor health in childhood may still be acting through labor supply but by reducing hours worked among the employed rather than selecting less healthy individuals out of the labor market completely. It also suggests that reduced wage rates are more likely a key mechanism. Unfortunately, we are not able to observe hours per year worked or wage rates. This is consistent with previous research that has found significant negative impact of early life health on occupational attainment (Case et al. 2005; Haas 2006).

Furthermore, we find that part of the earnings differential associated with poor child health is additionally accounted for by health-related selection into diminished educational attainment and the earlier onset of chronic disease. Estimated earnings disparities associated with poor childhood are substantially attenuated once controls for years of completed schooling and prior onset of a chronic disease are added to the model. The results provide support for both the social stunting and drift variants of the health selection hypothesis, with each having importance at different points in the life course. Early in the work career, reduced educational attainment acts to permanently shift earnings trajectories downward for the less healthy, while later in the career, the premature onset of chronic disease additionally acts to alter the shape of earnings trajectories.

Although our analysis has a number of strengths, it also has some limitations. Because of a lack of appropriate time-varying covariates observed concurrently with earnings, we are not able to estimate a selection model to adequately deal with the issue of unobserved earnings for those with zero earnings in a given year. This is especially problematic for estimating women's earnings, because most will spend a significant proportion of the working years out of the labor market. Ideally, a better measure of labor force participation, such as hours worked per week, would provide more leverage on how health trajectories, extending back into childhood, influence labor market outcomes.

Despite imperfectly controlling for employment selection, there are several reasons to think that these estimates are conservative. First, the effects we observe are somewhat smaller than those observed by Johnson and Schoeni (2007). Second, given the important role of early onset of health problems in selecting individuals out of the labor market or into part-time employment, results based on models in which those with zero earnings are dropped are likely to be conservative underestimates of the true adverse economic impacts of poor childhood health. The differences between estimates in Tables 2 and 3 would seem to bear this out. However, by observing individuals only to age 50, we should be minimizing the overall effect of adult health on labor supply. It is not until after age 50 that chronic disease has its greatest impact on labor supply. Third, we are only observing those who survived to be in the study (age 55 on average). Because we would expect that those who died prior to the start of the study were more likely to have had worse childhood health, we would expect that this mortality selection would lead to an underestimate of the true association. Fourth, because SSA earnings are capped for tax purposes, the top end of the earnings distribution is truncated. Under the reasonable assumption that on average, those with the highest earnings are disproportionately made up of the healthiest individuals, our estimates will be biased downward.[6] Finally, by modeling earnings below the age of 50, we have not captured peak earnings, in which we might expect earnings differences to be greatest.

Another limitation is that the exact nature of poor childhood health, and more precise discussion of the pathways through which it influences adult SES, cannot be discerned from these data. Although previous research has shown that the retrospective reports used here are of reasonable quality, they provide only a broad overview of early life health status. Although we are the first to estimate the impact of childhood health on labor market trajectories, our results, based on retrospective reports of childhood health, are consistent with prior research on European populations that found large impacts of childhood health on adult SES using other more objective measures of early life health status, including birth weight (Black et al. 2005) and chronic conditions (Case et al. 2005; Palloni 2006). Although the HRS-linked SSA data provided a unique opportunity to test for long-term impacts of early life health status, in the future, researchers should investigate the possibility of similar data linkages with other samples that may provide more comprehensive and robust information on childhood health status.

Finally, we are unable to make definitive causal claims about the relationship between childhood health and labor market outcomes. At its core, our argument rests on the temporal ordering of childhood health and labor market outcomes and that the observation of the respondent's labor market outcomes was collected independently of information on the early life health status. Unfortunately, we lack a source of exogenous variation in childhood health

to implement an instrumental variables approach, which would provide a much stronger purchase on the issue of causality. Although we have controlled for the usual suspects, the specter of omitted variable bias lingers. However, our results are consistent with other studies that have dealt with the issues of endogeneity and unobserved heterogeneity through a variety of estimation strategies, including sibling-fixed effects models (Haas 2006; Johnson and Schoeni 2007) and difference-in-difference models of twin birth weight (Black et al. 2005).

In conclusion, the results presented here suggest that early life health status plays a nontrivial role in structuring the process of social stratification. The results confirm findings from other studies documenting that those who experience adverse health events in childhood have substantially diminished life chances relative to their healthy peers. They acquire less human capital, occupy less prestigious and lower paid occupational niches, and are more likely to experience the early onset of chronic diseases and the functional limitations that accompany them. As the preceding analysis shows, these educational, occupational, and physiological deficits subsequently result in substantially compromised earnings trajectories over the work career. The results also put into context previous findings of very large differences in wealth at midlife (Haas 2006), as such differences reflect the cumulative impact of poor childhood health on labor market outcomes over the life course. Taken as whole, the findings suggest an important role for early life health in the genesis of social inequality.

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NOTES

1. The health selection hypothesis derives from a long-standing debate about the direction of causality in the association between SES and health. A full theoretical treatment of this debate is beyond the scope of the current article. See Haas (2006) for a full discussion of this debate.
2. The analytic sample does not differ from the larger HRS sample with regard to the distribution of childhood health, adult self-rated health, prior onset of adult chronic disease, age, gender, father's occupational standing, or marital status. The analytic sample is slightly less likely to be black (15.7% vs. 18.1%) or Hispanic (7.5% vs. 11%), is slightly more educated (12.2 vs. 11.6 years), and has slightly more educated parents (approximately 0.5 additional years for mother and father).
3. The age pattern of results is not sensitive to the specification of age in the model. We also estimated models with 3- and 5-year age groupings and a fully flexible model in which the effect of childhood health on earnings was allowed to differ across each individual year of age. The age pattern results are highly consistent with those presented here.
4. The decision to estimate separate models for men and women does not derive from a specific substantive interest in gender disparities per se. We had no a priori hypothesis that the impact of childhood health on earnings should vary by gender. However, the labor market experience of men and women in these cohorts was drastically different. For men, this represented the postwar boom, with high demand for labor, rising wages, and expansion of economic opportunities. For women, these cohorts are those that came of childbearing age during the baby boom. They were characterized by early age at marriage and childbearing and low rates of labor market participation. However, these women would later lead the mass movement of women into the labor market. For this reason, models of labor market outcomes are nearly always estimated separately for men and women. Most prior research on the labor market effects of childhood health examines only men.
5. We are unable to fit a selection model to account for the employment selection bias, because of a lack of appropriate variables for estimating the selection part of the model. This is an imperfect way to estimate the impact of employment selection. Unfortunately, the

EBF does not contain information on hours worked. Thus, we are unable to reconstruct employment histories directly. We also estimated random-effects logit models of employment trajectories (using positive earnings as a proxy for employment). We find significant effects of childhood health on life course trajectories of employment. The effects of childhood health mirror those observed for earnings.

6. The overall pattern of results from tobit models for truncated data was consistent with those presented here. However, the tobit estimates were somewhat larger.

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Bios

Steven A. Haas is an assistant professor of population dynamics at Arizona State University. His research examines the social and economic causes and consequences of poor health over the life course and the role of health in the stratification process. His recent work has appeared in *Demography*, *Social Forces*, the *Journal of Health and Social Behavior*, and *Social Science & Medicine*.

M. Maria Glymour is an assistant professor of society, human development and health at the Harvard School of Public Health. Her research focuses on how social factors experienced across the life course influence cognitive function, dementia, stroke, and other health outcomes in old age. Her work has appeared in the *American Journal of Public Health*, *Social Science & Medicine*, and the *Annals of Epidemiology*.

Lisa F. Berkman is the Thomas D. Cabot Professor of Public Policy and Epidemiology at the Harvard School of Public Health. She has published widely on the social determinants of health, with emphasis on the role of social networks and support in predicting declines in physical and cognitive functioning, the onset of disease, and mortality.