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Social Science & Medicine 52 (2001) 1269–1284

SOCIAL SCIENCE & MEDICINE

www.elsevier.com/locate/socscimed

Does childhood health affect chronic morbidity in later life?

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Abstract

Our analysis examines whether childhood health has long-term and enduring consequences for chronic morbidity. As a part of this analysis, we address two methodological issues of concern in the literature. Is adult height a surrogate for childhood health experiences in modeling chronic disease in later life? And, are the effects of adult socioeconomic status on chronic disease overestimated when childhood health is not accounted for? The analysis is based on a topical module to the third wave of the Health and Retirement Study, a representative survey of Americans aged 55–65 in 1996. Our results support the hypothesis that poor childhood health increases morbidity in later life. This association was found for cancer, lung disease, cardiovascular conditions, and arthritis/rheumatism. The associations were highly persistent in the face of statistical controls for both adult and childhood socioeconomic status. No support was found for using adult height as a proxy for the effects of childhood health experiences. Further, the effects of adult socioeconomic status were not overestimated when childhood health was excluded from the explanatory models. Our results point to the importance of an integrated health care policy based on the premise of maximizing health over the entire life cycle.

Keywords: Childhood health; Socioeconomic status; Adult health; Health and retirement study; USA

Introduction

Mounting evidence suggests that childhood life circumstances have an enduring effect on late life chronic morbidity. Although the roles of specific etiologic agents are topics of debate, research suggests that these effects may accrue from a range of factors including nutrition, exposure to infectious disease and environmental toxins, the in utero environment, and features of social and economic deprivation. Some scholars have hypothesized that chronic diseases are programmed during gestation or early childhood (e.g., the Barker hypothesis), while other scholars emphasize the role of accumulation of effects from exposure to adverse conditions over the life course (Forsdahl, 1977; Kuh & Davey Smith, 1997). Increasingly it is clear that a life course approach is important to understand how chronic morbidity comes about in later life. Such an approach encompasses the idea that chronic disease may be the long-term outcome of a range of childhood conditions and experiences, beginning as early as in utero combined with the cumulative "insults" experienced during adulthood (Kuh & Ben-Shlomo, 1997).

Our investigation adds to this growing body of literature by examining the association between self-reported childhood health experiences and the presence of a number of major chronic health problems among a nationally representative sample of Americans aged 55 to 65. Several issues guide our analysis. First, we assess whether self-reported childhood health experiences are associated with chronic health problems in later life, while controlling for socioeconomic deprivation in both childhood and adulthood. That is, we determine whether childhood health per se has long-term and direct consequences for chronic health conditions experienced decades after childhood. Second, we examine whether adult height is a surrogate for childhood health

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0277-9536/01/$ - see front matter
PII: S0277-9536(00)00230-6

experiences and deprivation in modeling chronic disease in later life. Adult height is often viewed as an indicator of childhood health and deprivation in analyses lacking direct measures of childhood life circumstances. Lastly, we assess whether the effects of adult socioeconomic status on chronic disease are overestimated when childhood conditions are not taken into account.

The analysis is based on a new population health survey representative of Americans born from 1931 to 1941, the Health and Retirement Survey (HRS). HRS respondents were interviewed in 1992, 1994, 1996, and 1998. We use the third wave of the HRS (1996) in this analysis because at this interview a randomly chosen subset of respondents ($N = 654$) recollected their health as children and reported their parental education and father's occupation, along with family living arrangements, and their family's financial well-being. At the same interview they reported details of their current adult health state. Measurement of both childhood health conditions and adult health is based on self-report data. Our analysis, therefore, focuses on associations between childhood conditions and health conditions at age 55–65 using self-reported information from a nationally representative survey. Previewing our results, despite the relatively small sample size of the HRS module, our statistical analysis reveals a strong association between childhood health and the occurrence of a variety of chronic health problems among middle-aged Americans.

Background

Social science and social epidemiological studies of chronic health problems have focused principally on the association between adult life circumstances, especially socioeconomic status, and disease prevalence or mortality at older ages. The general presumption is that socioeconomic status, as an enduring feature of adult life, gives rise to chronic health conditions, which by themselves develop slowly over the life cycle (Adler et al., 1994; Marmot, Kogevinas, & Elston, 1987).

In fact, evidence indicates that socioeconomic status may have a more pervasive, long-term effect, if one considers the possible ramifications of childhood deprivation. A growing number of studies support the idea that childhood life circumstances have enduring effects on late life chronic morbidity (Kuh & Ben-Shlomo, 1997). That is, rather than simply setting the stage for adult achievement which then affects health, childhood conditions may play a more direct role in influencing chronic disease decades later in old age. These effects may accrue from nutrition and dietary factors (Gunnell, Frankel, Nanchahal, Braddon & Davey Smith, 1996), in utero conditions (Barker, 1998; Barker, Bull, Osmond, & Simmonds, 1990; Barker et al., 1991; Martyn, Barker, & Osmond, 1996), and other features of deprivation (Arnesen & Forsdahl, 1985; Gliksman et al., 1995; Lundberg, 1993; Notkola, Punsar, Karvonen & Haapakoski, 1985; Peck, 1992; Peck, 1994). Behavioral factors may also play a role: conflicts or dissension in the childhood home and divorce of the parents have both been linked to illness in later life (Dahl & Birkelund, 1997; Lundberg, 1993,1997). There is also evidence of the direct effect of childhood exposure to infectious disease, viruses, and environmental toxins on adult health outcomes (Brunner et al., 1996; Kuh & Wadsworth, 1993; Power & Peckham, 1990).

A growing body of evidence documents the effects of early life health infections on cardiovascular disease, cancer, diabetes, and respiratory disease, and increasingly, models of biological processes are being developed to explain these associations (see Kuh & Ben-Shlomo, 1997). Using data from US Civil War veterans, Costa (2000) found that infectious illness during young adulthood was related to respiratory problems, heart problems and joint and back problems when the cohort was aged 50 to 64. An ecological analysis in the United States showed that areal levels of infection in childhood were related to higher areal levels of heart disease and respiratory cancer later in life (Buck & Simpson, 1982). Infectious disease in childhood is thought to be related to heart disease through its effect on autoimmune complexes and consequent development of atherosclerotic lesions, resulting in plaque accumulation over the life span (Buck & Simpson, 1982; Matthews, Whittingham, & Mackay, 1974). Early respiratory infections have been linked to later lung conditions (Barker, 1998). Higher levels of musculoskeletal conditions in older age have been linked to lasting joint problems resulting from earlier infectious diseases (Costa, 2000). Infectious disease in early life may be related to higher levels of some kinds of cancer through the interaction of vitamin metabolism in early life and later life exposure to carcinogens (Buck & Simpson, 1982; Hall & Peekham, 1997).

While the above discussion links infectious disease to higher levels of adult conditions, some research has raised the possibility that higher levels of early life infection could have positive health effects later in life. Higher levels of infection early in life, for example, may be related to lower levels of autoimmune conditions later in life (Paunio Patja et al., 2000). Following this reasoning, some have argued that the reduction in childhood infectious diseases over time could be linked to altered immune system development and the subsequent rise in conditions such as asthma.

As other researchers have pointed out, because many of these studies linking childhood and adult health do not include adequate controls for confounding factors associated with socioeconomic position persisting throughout childhood and during adulthood, there

remains a question as to whether the relationship between childhood and adult health could be indirect (Ben-Shlomo & Davey Smith, 1991; Elford, Whincup, & Shaper, 1991). Some research, however, has incorporated indicators of childhood health along with familial socioeconomic conditions and has demonstrated an association between later life health and childhood experiences, net of other important controls such as income (in adulthood) and education. One such study in the United Kingdom of men born between 1907 and 1930 who survived until at least 1951 showed that stroke and heart disease risks in adulthood were associated with maternal and fetal nutrition (Martyn, Barker, & Osmond, 1996). Kuh and Wadsworth (1993) found that childhood illness was related to health at age 36 in a British cohort when childhood socioeconomic status was controlled. A study in Norway found that serious illness after age 65 was related to "long-standing illness in childhood" (Dahl & Birkelund, 1997). Research based on the seven-decade Terman Life Cycle Study of Children with High Ability found no evidence of a relationship between longevity and the following variables: birth weight, health during infancy, childhood accidents and surgeries and parental socioeconomic characteristics (Schwartz et al, 1995). Parental divorce, however, was associated with a shorter life expectancy.

Thus, the existence of the association between childhood health conditions and chronic disease in later life remains a topic of research. If, indeed, childhood conditions have long-term health consequences, morbidity in later life may represent the combined effects of childhood programming, childhood exposure to unhealthy socio-environmental conditions and behaviors, along with a cumulative effect resulting from adult life cycle experiences. Unclear, as yet, is the extent to which childhood health is an exogenous explanatory factor like childhood social conditions, or whether it functions as a biomedical pathway connecting childhood social conditions and chronic disease.

Oftentimes, studies examining the effects of childhood health experiences on later life morbidity have used adult height as a proxy measure for childhood health conditions. For example, a number of studies have investigated the relationship between height and mortality in adulthood, and concluded that shorter individuals experience higher mortality in adulthood (Brunner et al., 1996; Elo & Preston, 1992; Floud, Wachter, & Gregory, 1990; Fogel, 1993). Elo and Preston (1992) point to several studies that found an effect of height on adult mortality caused by cardiovascular diseases. Although much of the evidence on the association between height and chronic disease is based on historical populations (Fogel & Costa, 1997; Fogel, 1993), there is also evidence of this association in contemporary populations. For example, Brunner et al. (1996) observed that measures of adult height were inversely associated with adult plasma fibrinogen, a risk factor related to coronary heart disease. Fogel (1993) found that a number of chronic conditions were much more common among short young men than among tall young men who participated in the 1985–1988 US National Health Interview Surveys. Additionally, Elo and Preston (1992) discussed Waaler's study of mortality by cause of death in Norway, which found that the principal causes that elevate mortality for shorter Norwegians were cardiovascular diseases, tuberculosis, and obstructive lung diseases.

Shorter height may be indicative of more than just childhood health, as lack of height has been related to a range of adverse social, nutritive, and medical circumstances in childhood. Some of the connections between adult height and later mortality may be indirect through the association of height with parental status, educational attainment and adult social status (and, in the United States, ethnicity), particularly for males (Elo & Preston, 1992; Peck & Lundberg, 1995; West, 1991). However, it should be noted that not all studies have found that taller height is related to positive health outcomes. Several studies have found height to be positively related to reproductive cancers (Barker, Osmond & Golding, 1990). For example, taller women may be more likely to get breast cancer (DeStovola, Wang, & Allen, 1993).

Preston and Taubman (1994) have suggested that failing to control for childhood health experiences — via proxy indicators such as adult height or other measures of childhood health — on health in later life can lead to mis-specifications and bias, incorrectly inflating the importance of later-life attributes and experiences. And, since poor health in childhood may also have direct and indirect consequences on educational and occupational attainment, "the direct effects of schooling on adult health status can be overestimated without proper controls on earlier experiences" (Preston and Taubman, 1994, p. 299).

The present study

Clearly, a number of factors — social and behavioral, genetic or familial, nutritive or environmental — play a role in later life morbidity and mortality. Because these factors may be felt at different points in the life cycle — prior to birth, throughout infancy, childhood, and adolescence, and during early-, mid-, and late-adulthood — they are complementary rather than competing explanations (Wadsworth & Kuh, 1997).

Our data include information on childhood life circumstances, specifically the occurrence of childhood illness and parental social/economic position as well as information on adult height and socioeconomic condition. We are thus in a position to examine the long-term

effects of childhood morbidity on health in later life, while controlling socioeconomic conditions in both childhood and adulthood. Logistic regressions are used to predict the probability of having a specific health condition among HRS respondents, most of whom range in age from 55 to 65 — we focus on cancer, diabetes, lung illnesses, cardiovascular conditions, and arthritis/rheumatism. We include controls for age, sex, race, and a series of indicators of family status in childhood and socioeconomic status in adulthood. These include father's occupation, parental education, intact family status in childhood, an indicator of "poverty" in family of origin, adult height, respondent education, and respondent wealth in middle age. We also identify the type of major illness experienced in childhood — specifically, whether it was an infectious disease, a childhood autoimmune condition, or another type of illness or ailment (Table 1 shows the classification of specific illnesses and conditions). We hypothesize that having an infectious disease or autoimmune condition as a child will significantly increase the likelihood of reporting a range of disease outcomes in middle age.

We estimate a series of nested models to evaluate how childhood health is associated with chronic health problems in one's fifties and sixties and how this association changes with controls for other variables. The baseline model estimates the total effect of childhood social and economic conditions and the effects of major demographic characteristics. We then add measures of individuals' childhood health experiences to assess their effects net of other childhood circumstances. A comparison of the effects of social and economic conditions of childhood across the two models allows us to identify whether childhood health operates as a biomedical pathway linking childhood social conditions and chronic morbidity. A series of models are then estimated incorporating the respondent's adult height, education, wealth, and adult co-morbid conditions to evaluate whether childhood health influences chronic morbidity directly or indirectly via adult life circumstances. These models also allow us to examine whether adult height serves as a useful surrogate for childhood health and/or deprivation in modeling late life chronic health problems and whether adult socioeconomic status effects are over-estimated in models omitting explicit measures of childhood health and social conditions.

Methods

Data overview

Our analysis is based on a topical module on childhood experiences from the third wave of the HRS. The first wave of the survey was fielded in 1992 for a nationally representative sample of persons born between 1931 and 1941 and their spouses or partners. Initial screening identified 15,497 individuals eligible for interview; interviews were obtained with 82% of these persons at the first wave. Respondents were re-interviewed in 1994, 1996, and 1998; overall response rates for 1994 and 1996 were 92% and 94%, respectively. Overall, 11,207 respondents participated in the 1996 interview; from these, 654 were randomly selected to participate in the childhood health module. The modules were asked at the end of the regular interview so all those randomly selected for inclusion responded. Approximately 95% of the total sample and the module sub-sample were at least 50 years of age; those younger were spouses. The 654 module respondents were statistically indistinguishable from the larger group of respondents in most respects. They differed somewhat in racial composition and educational level: 80% of the module participants and 71% of the larger survey were white non-Hispanics, while the average level of education was 12.3 years in the module group and 11.9 years in the total sample.[1]

Measures

The sub-sample's respondents were asked a series of questions about their health as children. Specifically, they were asked:

(1) if they ever missed one month or more of school due to a health condition;
(2) if they were restricted from participating in sports for three or more months due to a health condition;
(3) if they had to remain in bed at home for one month or more due to a health condition.

If they answered affirmatively to any one of these questions, they were asked the name of the condition that caused them to be incapacitated. In all, 17% of the respondents indicated that they had suffered such restrictions in childhood as a consequence of health problems due to illness. These illnesses and ailments ranged from serious, life-threatening childhood diseases to skin conditions, and are shown in Table 1.[2]

Because the number of individuals with specific diseases is small and because we are interested in the

[1] Similar conclusions are also obtained if a random sample of 654 *non*-module participants is taken, and their means on the independent variables are compared to those of the 654 module participants.

[2] Nine respondents stated that they missed school or had to stay in bed due to broken bones or injuries suffered in an accident. Since these cases were not the result of an illness per se, these respondents were included in the group with no disease.

Table 1
Types of childhood illnesses reported, HRS (1996), childhood health module ($n = 654$)

Type of illness	Type of illness	Count	Percent
Scarlet fever	Infectious	12	1.8
Pneumonia	Infectious	8	1.2
Infection/fever	Infectious	7	1.1
Measles	Infectious	5	0.8
Blood poisoning	Infectious	4	0.6
Whooping cough	Infectious	2	0.3
Pleurisy	Infectious	2	0.3
Tuberculosis	Infectious	2	0.3
Other infectious diseases[a]	Infectious	8	1.2
Rheumatic fever	Autoimmune	10	1.5
Arthritis	Autoimmune	3	0.5
Hay fever/allergies	Autoimmune	2	0.3
Asthma	Autoimmune	2	0.3
Appendicitis	Other	9	1.4
Intestinal problems/ulcer	Other	2	0.3
Anemia	Other	2	0.3
Skin conditions	Other	2	0.3
Scoliosis	Other	2	0.3
Others[b]	Other	12	1.8
Heart problem/murmur	Other	4	0.6
Unknown	Other	13	2.0
None	None (baseline)	541	81.5

[a] Other infectious diseases include single instances of "polio", "malaria", "sore throat", "diphtheria", "spinal meningitis", "childhood diseases", "strep throat", and "mumps".

[b] Others include single instances of such ailments as "headaches", "problem with legs", "eye surgery", "pregnancy", "psychological problems", "back problem", "knee problem", "bone problem", "botulism", "cancer", "hernia", and "quinsy".

effect of infectious diseases, autoimmune conditions, and other diseases, we make three indicators of childhood health. One measure identifies the 3% of module respondents who experienced an autoimmune condition (e.g., rheumatic fever, arthritis, asthma, or allergies) during childhood; a second measure indicates those who experienced an infectious disease or illness as children (8%); the third indicator represents the respondents who reported an incapacitating illness or ailment during childhood that was neither infectious nor autoimmune in nature (5%). Since respondents were only asked to name one condition, these three categories are mutually exclusive. In our analysis, we examine the consequences of having any incapacitating childhood health experience for health in later life, as well as the consequences of infectious and autoimmune conditions.

Health at age 55–65 is generated from self-reports collected at the same time as those on childhood health. Respondents indicate whether they have ever been told by a doctor that they have/had cancer (excluding skin cancer), diabetes, heart disease (including coronary heart disease, heart attack, congestive heart failure, and the occurrence of heart surgery), cerebrovascular disease (high blood pressure or stroke), chronic lung illnesses (e.g., emphysema and bronchitis), or arthritis/rheumatism.[3] We use this information to make five dummy variables indicating the presence of each of the diseases; we combine the heart and cerebrovascular diseases into one category. While these disease indicators are based on respondent reports, prior research has shown substantial agreement between survey self-reports of medical conditions and medical record reports of major medical conditions (Bush, Miller, Golden, & Hale, 1989; Pasty et al., 1995).

In order to conduct a systematic investigation of the effect of childhood illnesses on later life morbidity and to separate these effects from social and economic conditions in childhood, we examine their effects while controlling additional variables (Table 2). The demographic characteristics of age, sex, and race are controlled in all analyses. The respondent's sex is coded "1" for males, "0" for females, while his/her race is coded "1" for white non-Hispanics, "0" for non–whites. Childhood social and economic circumstances are indicated by parental education, father's occupation, a perceived family financial status variable, and whether the respondent's childhood family remained intact until age 16. Adult height and a race-by-height interaction are included to denote the effect of height. Socioeconomic status in adulthood is indicated by years of schooling completed and current wealth. Maternal and paternal education, and the respondent's education are treated as continuous variables and measured by school years completed.

Father's occupation is based on response to the following question:

"Now I want to ask you about some aspects of your family while you were growing up from birth to age 16. What was your father's main occupation (the most important one)?"

If respondents were unable to provide an immediate answer, they were then asked to describe what kind of work their fathers did. Responses were coded into a dummy term representing a father in a low income/low prestige occupation (e.g., operatives, laborers, farm laborers, private household workers); all other respon-

[3] All HRS morbidity items were constructed in the following manner. Respondents not interviewed in a previous wave were asked: "Has a doctor ever told you that you have [condition]?" (where *condition* is one of our diseases of interest). If the respondent said he/she had the condition at a previous wave, he/she was asked to confirm this information: "Our records (from your last interview in previous wave, month/year) show that you have had [condition]." A respondent not reporting said condition in a previous wave was asked" "Since we talked last (in previous wave, month/year) has a doctor told you that you have [condition]?"

Table 2
Characteristics of persons with and without a childhood health condition: Percents/means and counts/standard deviations (in parentheses) for variables of interest, HRS (1996), childhood health module ($n = 654$)

Variable	Experienced childhood health condition ($n = 113$)	Did not experience childhood health condition ($n = 541$)	T-test[a] (P-values indicate statistical significance)
Demographic characteristics			
Male (%)	43% (49)	47% (254)	−0.69
White (%)	86% (97)	79% (427)	1.63
R's age (years)	59.48 (5.14)	59.49 (5.47)	−0.03
Childhood circumstances			
Father was operative/laborer (%)	27% (31)	34% (184)	−1.54
Childhood family was "very poor" (%)	12% (14)	9% (49)	0.75
Mother's education (school years)	9.67 (2.50)	9.43 (2.96)	0.80
Father's education (school years)	9.48 (2.79)	9.11 (3.26)	1.12
R's childhood family intact through age 16 (%)	76% (86)	74% (400)	0.55
Adult risk factors and socioeconomic status			
Height (raw value, in inches)	67.47 (3.87)	66.92 (3.86)	1.38
Adjusted height (scaled value: 1 = shortest, 4 = tallest)	2.55 (1.13)	2.25 (1.08)	2.636 ($p < 0.001$)
R's education (school years)	12.57 (2.57)	12.24 (2.84)	1.14
Missing on education (%)	5% (6)	1% (5)	3.94 ($p < 0.001$)
Net worth (raw value in dollars, wave 1)	206,326 (320,288)	243,041 (473,220)	−0.79
Wealth (transformed value)	13.74 (0.24)	13.73 (0.65)	0.16
Missing on wealth (%)	12% (14)	6% (32)	2.36 ($p < 0.01$)

[a] Two-tailed t-test; a test statistic greater than 1.96 (or less than −1.96) is statistically significant at 0.05.

dents were included in the baseline category. To increase the number of observations in the models, those respondents with fathers in the "unknown" occupational category were included in the baseline category.

Childhood family economic status is based on a question which asked respondents how "well off" their family was while they were growing up. We identify those respondents who said their families were "very poor" in our analysis. A final indicator of the respondents' childhood living conditions is provided by whether the respondent lived with both parents through age 16. Among those respondents who answered negatively, we distinguish between respondents who lost a parent due to death, those whose household was disrupted by divorce or separation, and those whose household was otherwise disrupted (e.g. military service, financial reasons, incarceration).

Adult height, based on respondent's self-reports in 1992, was included in the analysis to see whether the inclusion of adult height would "explain away" any effects of our childhood health indicators on later-life morbidity.[4] Height is classified into sex specific quartiles and interaction terms with race are included to determine whether the effect may differ by race because the height distributions of the black and white populations differ in the United States (Chumlea, Guo, Wholihan & Chockram, 1998)

Socioeconomic status in adulthood is indicated by education and a measure reflecting wealth (i.e., net worth) in 1992. Wealth is included in the models using a logged measure transformed to eliminate negative values.[5] Respondents with missing information for height, net worth, "own" education, or maternal/paternal education[6] are assigned the mean value on the variable, and are then flagged with a separate "missing" indicator, again to retain all 654 module participants in our analysis. The coefficients for these missing flags seldom attain statistical significance in any of our

[4] Respondents were asked how tall they are without shoes. Answers are provided in feet and inches.

[5] The item used in our analysis is total net worth as reported in 1992. It is a constructed variable that takes into account all existing assets as well as debts. Since some respondents had negative values of wealth and because the distribution is skewed, we adjusted and transformed it in the following manner. The respondent with the lowest (i.e., most negative) value was scored "1" on adjusted net worth, while the absolute value of the most negative score was added to the net worth of all other respondents. The natural log of this value was then used as the variable in the models reported.

[6] Very few cases are missing information regarding adult height and education, and roughly 5% of respondents lack information regarding their wealth as adults. However, 15–16% of module respondents are missing maternal education, while 18–20% of respondents are missing paternal education.

models; hence, they are not reported in our tables. Results from the full models are available upon request, however.

Lastly, because having any medical condition in adulthood may be related to the presence of other conditions in either adulthood or childhood, we include indicators of co-morbidity from each of the other causes in our analysis. This allows us to estimate the effect of childhood health on one disease independently of others.

Modeling approach

Because our dependent variables are nominal states of health, we estimate a series of multivariate logistic models predicting the presence of each of the five health conditions.. These increasingly complicated models predicting the occurrence of cancer, diabetes, cardiovascular diseases, lung conditions, and arthritis/rheumatism begin by including sex, race, age, and childhood socioeconomic status (model 1), then add childhood health experiences (model 2), adult height (model 3), education (model 4), wealth (model 5), and co-morbidity in later life (model 6).

Results

Table 3 shows the prevalence of diseases in middle age by the presence or absence of any incapacitating childhood illness or condition. Persons who experienced a major childhood illness were more likely to report having cancer, chronic lung conditions, arthritis, and cardiovascular conditions. Some of the differences between those with and without childhood illness are quite large. Twice as many persons with childhood health problems had cancer or chronic lung disease by late middle age. Arthritis was about 33% higher among this group. However, they were not more likely to have diabetes.

Table 4 shows the relationships between adult disease outcomes and type of childhood disease after controls are introduced. In this table, childhood diseases are distinguished by type: infectious, non-infectious, and autoimmune. The difference between each type and the omitted state of having no childhood disease is indicated by the odds ratios. Panels a through e, each reflecting a different disease outcome, show the odds ratios for the series of increasingly complex models. In models 1 through 5, childhood health problems remain statistically positively associated with each of the adult health outcomes except diabetes.

The type of childhood illness differently impacts adult health. All adult health outcomes, with the exception of diabetes, are increased among those who have had a major bout of *infectious* disease in childhood. The occurrence of an infectious disease during childhood results in a four-fold increase in lung conditions in middle age, even when controls for later life co-morbid conditions are included. Once the controls for later life co-morbidity — principally lung illness and diabetes — are introduced (model 6), the effect of infectious disease in childhood on cardiovascular conditions and arthritis is explained away. This would suggest that this effect is related to these later life co-morbid conditions.

Other types of childhood illnesses appear to have less effect on adult health. Respondents who experienced a *non-infectious* disease as children were about three times more likely to report cancer, and almost two times more likely to report arthritis/rheumatism, by middle age. Note that the association between non-infectious childhood conditions and arthritis/rheumatism became statistically important when other later life co-morbid conditions were controlled.

These relationships between childhood health and adult health are not changed significantly when controls for height and socioeconomic status in adulthood are added to the models. The effect of childhood health is very robust for all diseases examined here (except diabetes). In fact, child health appears to be a more important explanatory variable of adult health outcomes than either adult or childhood socioeconomic status. Respondents who attained more education were statistically less likely to report diabetes, lung illnesses, and arthritis/rheumatism in middle age, but there is no association between wealth in adulthood and the chronic conditions examined here. Interestingly, we also

Table 3
Percents and counts (in parentheses) with specified medical conditions, US adults aged 55–65, HRS (1996)

	Experienced childhood health condition ($n = 113$)	Did not experience childhood health condition ($n = 541$)	t-test[a] (p-values indicate statistical significance)
Cancer	13% (15)	6% (32)	2.99 ($p < 0.01$)
Chronic lung conditions	14% (16)	7% (38)	4.06 ($p < 0.001$)
Arthritis/rheumatism	57% (64)	43% (233)	4.40 ($p < 0.001$)
Diabetes	10% (11)	12% (65)	0.96
Cardiovascular conditions	55% (62)	48% (260)	2.30 ($p < 0.05$)

[a] Two-tailed t-test; a test statistic greater than 1.96 (or less than −1.96) is statistically significant at 0.05.

Table 4
Odds ratios[a]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(a) *Predicting the probability of cancer at age 55–65*						
Male	0.463[b]	0.474[b]	0.454[b]	0.444[b]	0.413[b]	0.404[b]
White	1.416	1.312	0.196	0.208	0.230	0.258
Age	1.041	1.038	1.037	1.040	1.044	1.038
Parent died	0.438	0.472	0.504	0.478	0.446	0.406
Parents divorced/separated	0.308	0.315	0.312	0.306	0.275[c]	0.234[c]
Other non-intact family	0.657	0.687	0.646	0.637	0.648	0.599
Low father occupation	0.662	0.712	0.725	0.726	0.707	0.728
"Very poor" childhood family status	1.206	1.162	1.203	1.273	1.336	1.411
Mother's education	0.973	0.983	0.989	0.978	0.983	0.988
Father's education	1.015	1.001	0.999	0.984	0.964	0.980
Infectious childhood disease		2.683[b]	2.610[b]	2.643[b]	2.508[c]	2.241
Non-infectious childhood disease		3.382[b]	3.371[b]	3.189[b]	2.894[b]	3.071[b]
Autoimmune childhood disease		—	—	—	—	—
Height (in quartiles)			0.319[c]	0.331[c]	0.357	0.361
White×height (in quartiles)			3.231[c]	3.047[c]	2.830	2.752
Respondent's education				1.080	1.062	1.086
Respondent's wealth					0.900	0.888
Diabetes as adult						1.911
Cardiovascular conditions as adult						1.241
Lung illnesses as adult						2.082
Arthritis/rheumatism as adult						0.946
-2 log likelihood (degrees of freedom)	12.6 (12)	21.8 (14)	26.9 (17)	28.2 (18)	32.5 (21)	37.0 (25)
(b) *Predicting the probability of diabetes at age 55–65*						
Male	0.997	0.999	1.016	1.046	1.046	1.133
White	0.508[b]	0.527[b]	1.085	1.034	1.030	1.112
Age	1.045[c]	1.045[c]	1.046[c]	1.042	1.041	1.024
Parent died	1.298	1.355	1.333	1.327	1.335	1.437
Parents divorced/separated	1.231	1.226	1.237	1.238	1.250	1.218
Other non-intact family	0.829	0.833	0.887	0.856	0.848	0.969
Low father occupation	0.989	0.987	0.966	1.003	1.003	1.022
"Very poor" childhood family status	0.940	0.926	0.938	0.834	0.833	0.847
Mother's education	0.869[b]	0.864[b]	0.861[b]	0.875[b]	0.874[b]	0.872[b]
Father's education	1.041	1.042	1.044	1.065	1.065	1.080
Infectious childhood disease		1.479	1.474	1.482	1.494	1.193
Non-infectious childhood disease		0.566	0.545	0.598	0.603	0.482
Autoimmune childhood disease		0.570	0.599	0.583	0.593	0.487
Height (in quartiles)			1.302	1.273	1.273	1.236
White×height (in quartiles)			0.719	0.757	0.757	0.770
Respondent's education				0.912[c]	0.913[c]	0.925
Respondent's wealth					1.039	1.073
Cancer as adult						1.766
Cardiovascular conditions as adult						2.771[b]
Lung illnesses as adult						0.921
Arthritis/rheumatism as adult						1.788[b]
-2 log likelihood (degrees of freedom)	26.2 (12)	28.3 (15)	30.0 (17)	33.6 (18)	33.7 (20)	53.8 (24)

Table 4 (Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(c) *Predicting the probability of cardiovascular conditions at age 55–65*						
Male	1.094	1.107	1.116	1.124	1.126	1.163
White	0.595[b]	0.592[b]	0.976	0.954	0.960	1.006
Age	1.052[b]	1.052[b]	1.053[b]	1.052[b]	1.051[b]	1.040[b]
Parent died	0.922	0.949	0.951	0.949	0.963	0.938
Parents divorced/separated	1.425	1.415	1.427	1.426	1.450	1.490
Other non-intact family	0.505[c]	0.507[c]	0.522[c]	0.521[c]	0.520[c]	0.531
Low father occupation	0.773	0.781	0.772	0.775	0.775	0.779
"Very poor" childhood family status	1.075	1.055	1.059	1.030	1.031	1.064
Mother's education	0.993	0.990	0.988	0.994	0.993	1.004
Father's education	0.968	0.966	0.966	0.972	0.972	0.965
Infectious childhood disease		1.738[c]	1.740[c]	1.733[c]	1.733[c]	1.454
Non-infectious childhood disease		1.093	1.075	1.092	1.100	1.119
Autoimmune childhood disease		1.258	1.271	1.237	1.250	1.191
Height (in quartiles)			1.241	1.225	1.224	1.218
White×height (in quartiles)			0.790	0.807	0.806	0.805
Respondent's education				0.971	0.972	0.992
Respondent's wealth					1.065	1.073
Cancer as adult						1.230
Diabetes as adult						2.866[b]
Lung illnesses as adult						2.287[b]
Arthritis/rheumatism as adult						1.116
-2 log likelihood (degrees of freedom)	29.6 (12)	33.0 (15)	34.5 (17)	35.3 (19)	35.7 (21)	58.6 (25)
(d) *Predicting the probability of lung conditions at age 55–65*						
Male	0.830	0.884	0.879	0.921	0.923	1.107
White	1.195	1.255	0.754	0.665	0.581	0.599
Age	1.080[b]	1.081[b]	1.083[b]	1.080[b]	1.081[b]	1.060[b]
Parent died	1.274	1.482	1.478	1.362	1.336	1.440
Parents divorced/separated	1.162	1.145	1.113	1.077	1.122	1.298
Other non-intact family	0.981	1.056	1.043	0.997	0.904	1.121
Low father occupation	0.742	0.758	0.765	0.775	0.783	0.704
"Very poor" childhood family status	1.584	1.508	1.504	1.250	1.262	1.384
Mother's education	1.055	1.042	1.042	1.086	1.077	1.081
Father's education	0.972	0.964	0.966	0.992	0.997	1.019
Infectious childhood disease		4.243[b]	4.163[b]	4.412[b]	4.897[b]	4.143[b]
Non-infectious childhood disease		0.596	0.592	0.691	0.762	0.577
Autoimmune childhood disease		2.848	2.772	2.547	2.876	2.637
Height (in quartiles)			0.882	0.846	0.811	0.802
White×height (in quartiles)			1.263	1.402	1.465	1.508
Respondent's education				0.848[b]	0.858[b]	0.868[b]
Respondent's wealth					1.020	1.263
Diabetes as adult						0.908
Cardiovascular conditions as adult						2.378[b]
Cancer as adult						2.114
Arthritis/rheumatism as adult						3.228[b]
-2 log likelihood (degrees of freedom)	15.7 (12)	29.3 (15)	29.9 (17)	38.5 (18)	45.7 (20)	67.4 (24)

Table 4 (Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(e) *Predicting the probability of arthritis/rheumatism at age 55–65*						
Male	0.516[b]	0.522[b]	0.527[b]	0.534[b]	0.533[b]	0.524[b]
White	1.048	1.010	2.051	1.963	1.952	2.065
Age	1.067[b]	1.068[b]	1.069[b]	1.066[b]	1.067[b]	1.059[b]
Parent died	0.846	0.866	0.862	0.861	0.842	0.802
Parents divorced/separated	1.057	1.050	1.065	1.067	1.052	1.026
Other non-intact family	0.778	0.797	0.830	0.823	0.821	0.856
Low father occupation	1.434[b]	1.478[b]	1.456[b]	1.475[b]	1.474[b]	1.532[b]
"Very poor" childhood family status	0.991	0.960	0.967	0.904	0.904	0.886
Mother's education	0.974	0.973	0.971	0.984	0.985	0.988
Father's education	0.958	0.956	0.956	0.968	0.968	0.964
Infectious childhood disease		1.844[b]	1.861[b]	1.845[c]	1.847[c]	1.526
Non-infectious childhood disease		1.631	1.600	1.668	1.661	1.731[c]
Autoimmune childhood disease		2.498[c]	2.541[c]	2.391	2.368	2.186
Height (in quartiles)			1.313	1.276	1.277	1.274
White×height (in quartiles)			0.721[c]	0.756	0.757	0.755
Respondent's education				0.932[b]	0.932[b]	0.948
Respondent's wealth					0.924	0.917
Diabetes as adult						1.783[b]
Cardiovascular conditions as adult						1.113
Lung illnesses as adult						2.951[b]
Cancer as adult						1.001
-2 log likelihood (degrees of freedom)	41.3 (12)	49.7 (15)	52.5 (17)	56.9 (19)	57.4 (21)	74.4 (25)

[a] Note: These models include parameters for missing information on mother's and father's education, respondent's education, height, and wealth. The resulting coefficients seldom reach statistical significance and are not reported as a result. Full models are available upon request. "—" indicates parameter could not be estimated

[b] indicates significance at 0.05.

[c] indicates significance at 0.10.

found some evidence to suggest that childhood socioeconomic status can have lasting, independent effects on health across the life course, even after controlling for adult socioeconomic status and childhood health: having a better educated mother lowers the odds of reporting diabetes in middle age, while having a father in a higher income occupation decreases the odds of reporting arthritis/rheumatism. Still, our findings suggest that the overall impact of childhood illnesses, relative to these other explanatory factors, is measurably stronger.

We next explore the possibility that adult height acts as a proxy for childhood health or social conditions. Table 5, panels a–e, presents odds ratios from a series of five models predicting cancer, diabetes, cardiovascular conditions, lung illnesses, and arthritis/rheumatism. Model 1 contains only the demographic variables; model 2 adds the childhood health variables; model 3 contains the demographic variables and height. Models 2 and 3 can be compared to see if height is a good proxy for childhood health. Model 4 includes both the childhood health and height variables together to again compare the two; and model 5 adds an interaction term for race and height to see if this provides a better explanation.

Examination of model 3 in each panel shows that height does not relate directly to any of the adult health outcomes in this sample. Moreover, the relationship between the childhood health and adult health outcomes is not changed when height is added (model 4): notice the consistency of the odds ratios associated with the childhood health conditions in models 2 and 4.

When height does have an effect on later life morbidity — specifically regarding cancer and arthritis/rheumatism — it is mediated by the respondent's race (panels 5a and 5e, model 5). The meaning of these relationships is difficult to interpret. The odds ratios indicate that both short and tall white respondents are equally unlikely to report cancer (the odds ratio for both is roughly equivalent, 0.22). In contrast, tall non-white respondents are more likely to report cancer (their odds ratio is 0.009), while their shorter counterparts are less likely (than either whites or tall non-whites) to report cancer (their corresponding odds ratio is 0.31). There is thus the suggestion that, in the case of cancer, taller non-whites are more likely to get cancer. Note that similar conclusions can be drawn from model 4, Table 4a; however, the addition of a measure representing the respondent's wealth in adulthood (model 5, Table 4a) reduces the effect of height to non-significance, even

Table 5
Odds ratios[a]

	Model 1	Model 2	Model 3	Model 4	Model 5
(a) *Predicting the probability of cancer at age 55–65*					
Male	0.486[b]	0.494[b]	0.482[b]	0.488[b]	0.472[b]
White	1.471	1.339	1.666	1.502	0.201
Age	1.038	1.037	1.039	1.038	1.038
Infectious childhood disease		2.793[b]		2.802[b]	2.643[b]
Non-infectious childhood disease		3.594[b]		3.554[b]	3.588[b]
Autoimmune childhood disease		—		—	—
Height (in quartiles)			0.949	0.920	0.310[c]
White×height (in quartiles)					3.330[c]
-2 log likelihood	5.6, 3 df	15.9, 5 df	6.7, 5 df	16.8, 7 df	21.6, 8 df
(b) *Predicting the probability of diabetes at age 55–65*					
Male	0.925	0.927	0.925	0.929	0.943
White	0.420[b]	0.431[b]	0.419[b]	0.429[b]	0.861
Age	1.055[b]	1.056[b]	1.055[b]	1.056[b]	1.056[b]
Infectious childhood disease		1.309		1.304	1.319
Non-infectious childhood disease		0.593		0.590	0.572
Autoimmune Childhood Disease		0.532		0.530	0.552
Height (in quartiles)			1.010	1.015	1.265
White×height (in quartiles)					0.729
-2 log likelihood	14.7, 3 df	16.4, 6 df	14.7, 4 df	16.4, 7 df	18.0, 8 df
(c) *Predicting the probability of cardiovascular conditions at age 55–65*					
Male	1.069	1.080	1.071	1.082	1.091
White	0.592[b]	0.585[b]	0.584[b]	0.574[b]	0.938
Age	1.055[b]	1.056[b]	1.055[b]	1.056[b]	1.056[b]
Infectious childhood disease		1.728[c]		1.721[c]	1.743[c]
Non-infectious childhood disease		1.124		1.121	1.114
Autoimmune childhood disease		1.322		1.321	1.350
Height (in quartiles)			1.046	1.035	1.255
White×Height (in quartiles)					0.791
-2 log likelihood	20.0, 3 df	23.5. 6 df	20.4, 5 df	23.8, 8 df	25.2, 9 df
(d) *Predicting the probability of lung conditions at age 55–65*					
Male	0.843	0.898	0.846	0.902	0.896
White	1.080	1.066	1.058	1.051	0.605
Age	1.083[b]	1.086[b]	1.085[b]	1.087[b]	1.087[b]
Infectious childhood disease		4.191[b]		4.140[b]	4.125[b]
Non-infectious childhood disease		0.615		0.608	0.616
Autoimmune childhood disease		3.128[c]		3.077[c]	3.008[c]
Height (in quartiles)			1.084	1.051	0.846
White×height (in quartiles)					1.302
-2 log likelihood	7.6, 3 df	21.7, 6 df	7.9, 4 df	21.8, 7 df	22.3, 8 df
(e) *Predicting the probability of arthritis/rheumatism at age 55–65*					
Male	0.499[b]	0.502[b]	0.499[b]	0.503[b]	0.508[b]
White	0.980	0.946	0.972	0.928	1.970
Age	1.072[b]	1.073[b]	1.072[b]	1.073[b]	1.074[b]
Infectious childhood disease		1.706[c]		1.726[c]	1.758[c]
Non-infectious childhood disease		1.537		1.549	1.531
Autoimmune childhood disease		2.494[c]		2.546[c]	2.628[c]
Height (in quartiles)			1.020	1.000	1.336[c]
White×height (in quartiles)					0.701[c]
-2 log likelihood	28.1, 3 df	35.3, 6 df	28.2, 5 df	35.5, 8 df	38.9, 9 df

[a] Note: These models include parameters for missing information on respondent's height. The resulting coefficients never reach statistical significance and are not reported as a result. Full models are available upon request. a"—" indicates parameter could not be estimated.

[b] indicates significance at 0.05.

[c] indicates significance at 0.10.

though wealth has no measurable direct impact on the likelihood of reporting cancer.

In addition, Table 5e suggests that tall non-whites are *more* likely to report arthritis/rheumatism than either shorter non-whites or whites regardless of height. Once we consider both the direct and indirect effects of height, the calculated odds ratios are 3.2, 1.3, 1.5, and 1.8 for the tallest non-whites, shortest non-whites, tallest whites, and shortest whites, respectively. However, the effects associated with childhood diseases remain despite the controls for height. Again, note that the direct and indirect height effects are reduced with the introduction of respondent's education in model 4, Table 4e.

Lastly, we explore the possibility that the effects of adult socioeconomic status indicators are overestimated when childhood conditions (both health and familial socioeconomic status) are not taken into account. Therefore, we re-estimate the models in Table 4, omitting the indicators of socioeconomic conditions in the family of origin (the three intact family measures, low paternal occupation, the "very poor" family status measure, and the parental education indicators) and the childhood disease measures. The results are presented in Table 6, panels a–e.[7] We find little evidence to suggest that the effects of adult education and wealth on adult morbidity are overestimated if childhood health and familial conditions are not controlled in the models. The only exception seems to be in the case of arthritis/rheumatism: respondent's education becomes statistically important in predicting arthritis in middle age when controls for childhood health and familial socioeconomic status are omitted (compare panel 6e, model 4, to panel 4e, model 6). However, there is no evidence of any similar effect in the models predicting the four other disease outcomes. We thus conclude that the omission of information on childhood health and socioeconomic conditions does not necessarily change the observed relationships between adult health and socioeconomic status measures (or the remaining controls indicating sex, race, age, and co-morbid conditions).

Conclusions

Our analysis of the self-reports of major limiting childhood health conditions supports the hypothesis that poor health in childhood is associated with a higher rate of chronic morbidity in later life. Respondents who experienced childhood health problems were more likely to experience a variety of chronic illnesses and conditions such as cancer, lung illnesses, cardiovascular conditions, and arthritis/rheumatism. On the other hand, we found no statistical association between childhood health problems and diabetes.

Additionally, our results suggest that it is important to distinguish between infectious and non-infectious childhood diseases whenever possible. Non-infectious diseases are associated with higher rates of cancer and arthritis or rheumatism in later life, while infectious diseases are strongly associated with lung conditions such as emphysema and bronchitis. The relationship between infectious disease in childhood and cardiovascular conditions in middle age was eliminated with the addition of controls for concurrent reports of diabetes and lung illnesses. In addition, while we did not obtain statistically significant associations between childhood autoimmune conditions and the five diseases we investigated, the magnitude of the resulting odds ratios, particularly in the models predicting lung illnesses and arthritis, suggests that such relationships might be found in a larger sample.

The associations between childhood health conditions and morbidity in later life were highly persistent in the face of statistical controls for both adult and childhood socioeconomic conditions. That these associations were not diminished in magnitude when taking account of these other explanatory factors points to two important conclusions. First, childhood health experiences appear to have rather extraordinary long-term consequences that are not ameliorated by adult life circumstances. Second, childhood health experiences appear to be an additional exogenous factor influencing chronic health problems in later life, rather than a major biomedical pathway linking childhood socioeconomic conditions with chronic health problems.

While we believe our results are significant, particularly given the small number of cases available for analysis, the relatively small sample size limited the detail we could use in specifying either childhood or adult conditions. In addition, we were not able to clarify whether these illnesses occurred in early childhood or in adolescence. Our results support the idea that self-report measures of childhood health, though clearly limited, are important risk factors that should be included in national health surveys.

The self-report nature of these items, however, raises several issues that must be kept in mind while interpreting our results. Representative population health surveys such as those utilized here rarely have access to administrative records and thus are required to directly query respondents about childhood conditions. It is possible, therefore, that self-reports affect observed relationships. Axiomatically, it may be difficult for middle-aged respondents to remember childhood health

[7] The models in Tables 4 and 6 differ in that the variables indicating childhood circumstances are not included in Table 6. Model 1 in Table 6 is comparable to model 1 in Table 4; model 2 in Table 6 corresponds to model 3 in Table 4; model 3 in Table 6 corresponds to model 5 in Table 4; and model 4 in Table 6 is comparable to model 6 in Table 4.

Table 6
Odds ratios[a]

	Model 1	Model 2	Model 3	Model 4
(a) *Predicting the probability of cancer at age 55–65*				
Male	0.486[b]	0.463[b]	0.425[b]	0.426[b]
White	1.471	0.196	0.216	0.250
Age	1.038	1.039	1.048	1.041
Height (in quartiles)		0.289[c]	0.314[c]	0.326[c]
White×height (in quartiles)		3.670[c]	3.323[c]	3.172[c]
Respondent's education			1.064	1.084
Respondent's wealth			0.958	0.951
Diabetes as adult				1.697
Cardiovascular conditions as adult				1.213
Lung illnesses as adult				1.889
Arthritis/rheumatism as adult				1.024[a]
-2 log likelihood	5.6, 3 df	11.9, 6 df	18.4, 10 df	22.1, 14 df
(b) *Predicting the probability of diabetes at age 55–65*				
Male	0.925	0.936	0.989	1.118
White	0.420[b]	0.822	0.855	0.840
Age	1.055[b]	1.056[b]	1.045[b]	1.026
Height (in quartiles)		1.251	1.230	1.166
White×height (in quartiles)		0.736	0.775	0.810
Respondent's education			0.894[b]	0.907[b]
Respondent's wealth			1.008	1.023
Cancer as adult				1.643
Cardiovascular conditions as adult				2.772[b]
Lung illnesses as adult				0.936
Arthritis/rheumatism as adult				1.759[b]
-2 log likelihood	14.7, 3 df	16.2, 5 df	22.9, 8 df	43.3, 12 df
(c) *Predicting the probability of cardiovascular conditions at age 55–65*				
Male	1.069	1.078	1.089	1.133
White	0.592[b]	0.929	0.927	0.974
Age	1.055[b]	1.056[b]	1.053[b]	1.042[b]
Height (in quartiles)		1.251	1.223	1.214
White×height (in quartiles)		0.804	0.830	0.831
Respondent's education			0.960	0.982
Respondent's wealth			1.061	1.072
Diabetes as adult				2.851[b]
Cancer as adult				1.238
Lung illnesses as adult				2.402[b]
Arthritis/rheumatism as adult				1.122
-2 log likelihood	20.0, 3 df	21.7, 5 df	23.9, 9 df	48.9, 13 df
(d) *Predicting the probability of lung conditions at age 55–65*				
Male	0.843	0.842	0.899	1.111
White	1.080	0.552	0.570	0.519
Age	1.083[b]	1.085[b]	1.073[b]	1.044
Height (in quartiles)		0.839	0.799	0.746
White×height (in quartiles)		1.363	1.495	1.601
Respondent's education			0.860[b]	0.869[b]
Respondent's wealth			1.001	1.066
Diabetes as adult				0.820
Cardiovascular conditions as adult				2.497[b]
Cancer as adult				2.019
Arthritis/rheumatism as adult				2.845[b]
-2 log likelihood	7.6, 3 df	8.7, 5 df	20.0, 8 df	41.2, 12 df

Table 6 (Continued)

	Model 1	Model 2	Model 3	Model 4
(e) *Predicting the probability of arthritis/rheumatism at age 55–65*				
Male	0.499[b]	0.503[b]	0.514[b]	0.509[b]
White	0.980	1.992	2.024	2.197[c]
Age	1.072[b]	1.073[b]	1.068[b]	1.060[b]
Height (in quartiles)		1.337[b]	1.297	1.298
White×height (in quartiles)		0.717[b]	0.758	0.749
Respondent's education			0.919[b]	0.936[b]
Respondent's wealth			0.933	0.931
Diabetes as adult				1.760[b]
Cardiovascular conditions as adult				1.125
Lung illnesses as adult				2.734[b]
Cancer as adult				1.066
-2 log likelihood	28.1, 3 df	31.2, 5 df	40.0, 9 df	56.6, 13 df

[a] Note: These models include parameters for missing information on respondent's height, education, and wealth. The resulting coefficients never reach statistical significance and are not reported as a result. Full models are available upon request.

[b] indicates significance at 0.05.

[c] indicates significance at 0.10.

problems, resulting in an under-report of childhood health problems. In addition, it is possible that persons experiencing a major chronic condition in adulthood may have searched their memory looking for causes of this experience. This would result in inflated relationships between younger and older heath outcomes. However, this implies that individuals in the population have a relatively sophisticated life course perspective on the etiology of their health. Since the relationship between childhood illness and adult health is generally not a part of popular knowledge, it seems unlikely that persons would have seized on this explanation for their poor health in middle age.

Another possible problem with our reports of childhood health is the fact that persons with fewer years of schooling might be less likely to report a health problem that caused them to miss school. In our analysis, however, we observed very little change in the association between childhood health and chronic diseases when education is controlled, thus suggesting that this is not a major issue. Further, our measure of childhood health is multidimensional in the sense that three indicators, two of which are independent of school attendance, are used to define childhood health experience.

It is plausible to expect that the reporting of chronic conditions will be influenced by health care use. For example, persons of lower socioeconomic status may under-report chronic illnesses because of lower rates of health care use. However, it is also unlikely that persons can accurately classify symptoms according to disease in the absence of physician diagnosis. We acknowledge, therefore, that the true socioeconomic status gap in health is likely to be greater than reported here.

Consistent with previous research on height and cancer mortality, our findings provide limited evidence to suggest that taller non-whites are more likely to have cancer in middle age, although this effect is explained away in the full models. It should be noted that since we are investigating morbidity among people alive to report it, people who have died of cancer are not included in the cohort. Because of sample size, we were unable to separate types of cancer into those who have had lung cancer and those with breast cancer. It is possible that the relationships between height and these two prominent cancers at this age are in the opposite direction. It is also possible that in a multiethnic society, such as the United States, height varies across ethnic groups so that the usual height/health relationships that exist in more genetically homogeneous societies are not found.

In some ways, the experience of this birth cohort with infectious disease is becoming unique. Sample members were born between the years of 1931 and 1941. Since that time, immunizations have become more widespread and the nature of childhood illnesses has changed — the rates of scarlet fever, tuberculosis, measles and rheumatic fever among children have plummeted in recent decades. Our results suggest that this bodes well for the health of future old as well as young persons. However, because substantial numbers of poor and minority children in the United States continue to experience higher rates of infectious disease, childhood health conditions are likely to play a continuing role in determining inequality in chronic health conditions of older adults.

From a policy perspective, our findings suggest that health care policies targeting the well-being of children could have considerable, albeit long-term, benefits for

adult health. Indeed, our results point to the need for an integrated health care policy based on the premise of maximizing health and well-being over the entire life cycle rather than focusing on the health of specific age groups. As Preston (1984) has argued, society as a whole gains more from a life course perspective than a generational perspective. Investing in children's health is sound policy for both individuals and societies: individuals gain longer, healthier lives while the collective costs of health care to future generations of elderly are reduced. This is particularly important given that future cohorts of children are expected to live to older, and still older, ages.

Acknowledgements

Partial support for this research was provided by grants from the National Institute of Aging (R01 AG11758, R01 AG11235, and T32 AG00208) and the National Institute of Child Health and Human Development (5 P30 HD28263). We would like to thank Professor Blaxter and the three anonymous *Social Science and Medicine* referees for their very helpful comments on an earlier version of this paper.

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