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ABSTRACT

In this paper we explore income and race differences in nine measures of the health of children aged 6 through 11. We show that when health measures from mid-childhood are the subject of analysis, both income and race differences are much less pronounced than they are in infant mortality and birth weight data. We do find differences in the health status of black and white children and of children from high and low income families, but these differences by no means overwhelmingly favor the white or high-income children. With respect to differences by race, whether or not they are adjusted for differences in associated socioeconomic factors, black children in many cases are in better health than their white counterparts. In the case of income differences in health, the high income children do appear to be in better health according to most measures, but their advantage is greatly diminished when one controls for related socioeconomic factors like parents' educational attainment. Even so, for measures relating to the "new morbidity," such as the presence of allergies or excessive tension, children from higher income families are in worse health.

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I. Introduction

Recent studies of children's health in the United States have stressed the differences between black and white children and between children in high and low income families. Newberger, Newberger, and Richmond (1976), for example, cite mortality rates for both infants and older children that are over 50 percent higher for blacks than for whites (pp. 252-53). They also point out that the incidence of low birth weight (a good negative indicator of whether an infant will survive his first year and of his successful future development) is more prevalent among black and poor families. Similar statistics are cited by Keniston (1977) and the National Research Council (1976).

The income and race comparisons in children's health status cited above, as well as those cited elsewhere, rely primarily on measures that relate to the first year of the child's life. This results largely from the unavailability of comprehensive measures of morbidity for older children. Recent publication of data from Cycles II and III of the Health Examination Survey, however, makes it possible to explicitly study the health of older children. In this paper we use data from Cycle II, which covers children aged 6 through 11 years, to explore income and race differences in nine measures of children's health.

We report two kinds of results. First, we show that when health measures from mid-childhood are the subject of analysis, both income and race differences are much less pronounced than they are in infant mortality data. Second, these differences do not uniformly favor children from white or higher-income families. Indeed, children from poor families and black families are found to be in <u>better</u> rather than worse health when measures that reflect the "new morbidity" are examined. This is the phrase originated by Haggerty, Roghmann, and Pless (1975) to describe "learning difficulties and school problems, behavioral disturbances, allergies, speech difficulties, visual problems, and the problems of adolescents in coping and adjusting" (p. 316). They observe that over this century the traditional childhood diseases have been declining in importance while health problems associated with the new morbidity have become more widespread. That is, growing levels of family income in this century have been accompanied by an increased prevalence of the new morbidity. This observation is remarkably parallel to our own findings of a positive association between family income and the incidence of this type of health problem.

II. Measuring Health in the Cycle II Sample

Cycle II of the Health Examination Survey is an exceptional source of information about a national sample of 7,119 noninstitutionalized children aged 6 to 11 years in the 1963-65 period.[1] The data comprise complete medical and developmental histories of each child provided by the parent, information on family socioeconomic characteristics, birth certificate information, and a school report with data on school performance and classroom behavior provided by teachers or other school officials. Most important, there are objective measures of health from physical examinations administered by the Public Health Service. Together, the data provide an unusually detailed picture of the health of children in this cohort.

Given the unusual detail and diversity of the health data in the Cycle II survey, the choice of health status measures is not dictated by data availability but rather is an issue that must be faced directly. The problem of defining and measuring children's (and adults') health is very much an unresolved one, even among professionals in the area of public health.[2] The economist's approach is to define health as a form of human capital which determines the amount of time available for consumption and for work in the home and labor market.[3] (Individuals may also derive disutility, or even utility, from the state of being ill.) With this type of definition, an appropriate measure of health status over some time period would be the proportion of potential time that is actually available for usual consumption, maintenance, and work activities. Similarly, the complementary measure of ill health would be the proportion of time lost as a result of imperfect functioning. Such disability may be relatively easy to measure when dealing with adults who are members of the labor force (a good approximation is days lost from work because of illness), but it is not easy to measure for other adults or for children. Therefore, in economists' studies of adults' health, both the incidence of particular physical conditions and the individual's own assessment of his health status have been used as supplementary health measures [Grossman (1975)].

We use the same type of restricted, morbidity-oriented, definition of children's health--focusing on the child's physical health rather than his overall well-being--and similar types of measures--disability, physical conditions, and parental assessment of health status. Even some of these measures, however, may not always be appropriate for children. There is a natural sequence of childhood diseases and acute conditions which prevent children from carrying out their normal activities but may not reflect their health capital or "permanent" health. A useful distinction to make here is between "permanent" health--one's prospect for life preservation and normal lifetime functioning--and "transitory" health--short-run deviations from one's normal state of health. It is the child's "permanent" health status that we wish to study, and we seek to use health measures which are good indicators of that "permanent" health status.[4]

In some situations a single overall index of permanent health might be desired--to parsimoniously describe the health status of a population, for example, or to allocate public funds. Infant mortality statistics are frequently used in this way. Health, however, is clearly a multidimensional concept. Consequently we use a set of health measures rather than a single index. Analysis of a set of component measures also avoids the essentially arbitrary weighting of the various dimensions of health implied by a health index.[5] Finally, such analysis allows for the possibility that the various aspects of children's health are differentially related to family income and race.

The actual choice of components of children's health status to be examined has been guided by the child health literature,[6] as well as by discussions with public health pediatricians.[7] The measures are listed and described below.

1. The parent's assessment of the child's overall current health, represented by PFGHEALTH. PFGHEALTH is a dichotomous variable indicating whether the parent views the child's health as poor, fair, or good (as opposed to very good).

2. Current height, represented by IHEIGHT. Height is a standard indicator of children's nutritional status [for example, National Center for Health Statistics (1970) and (1975); Seoane and Latham (1971)], and good nutrition is an obvious and natural vehicle for maintaining children's health. Since it is well known that physical growth rates differ by age and sex, IHEIGHT is computed as the difference between the child's actual

height and the mean height for his or her age-sex group divided by the standard deviation of height for that age-sex group.[8]

3. The child's visual acuity, represented by the dichotomous variable ABVIS. ABVIS indicates if the child has abnormal distance vision. All children were examined without their eyeglasses; their uncorrected binocular distance vision is defined as abnormal if it is worse than 20/30 [NCHS (1972)].

4. The child's blood pressure, represented by HDBP. HDBP is a dummy variable which indicates if the child's diastolic blood pressure exceeds the 95th percentile for his or her age and sex.

5. Whether or not the child has hayfever or other allergies, represented by the dummy variable ALLEG.

6. An assessment of the child's level of tension, represented by the dummy variable TENS. TENS characterizes children who are rated by their parents as "high strung" or "moderately tense." Both the tension and allergy variables may be regarded as measures of the "new morbidity."

7. The presence of one or more "significant acquired abnormalities" on physical examination of the child, represented by the dummy variable ACABN. These abnormalities include heart disease; neurological, muscular, or joint conditions; and other major diseases.[9]

8. The child's periodontal index, represented by APERI. APERI is a good overall indicator of oral health as well as a correlate of nutrition [Russell (1956)]. Since the periodontal index is known to differ systematically by age and sex, APERI it is standardized by age and sex in the same manner as is height. Higher values of APERI denote poorer values of oral health.[10]

9. Excessive absence from school for health reasons during the past six months, represented by the dichotomous variable SCHABS. This variable is taken from information provided by the child's school.[11]

Precise definitions of the above health measures appear in Table 1 along with a notation concerning the source of each variable (medical history, physician's exam, birth certificate, or school form). As is implied in the above definitions, IHEIGHT is a positive correlate of good health and PFGHEALTH, ABVIS, HDBP, ALLEG, TENS, ACABN, APERI, and SCHABS are negative correlates of good health.

III. Race and Income Differences in Health Status in the Cycle II Sample

Table 2 presents the mean levels of these nine health measures for the whole sample as well as by family income and by race.[12] The two family income classes are under \$5,000 per annum and \$5,000 or more per annum. This income cutoff is selected because it identifies the lowest quartile of the income distribution for the Cycle II sample. For purposes of comparison, Table 2 also includes statistics on infant mortality and the incidence of low birth weight for corresponding income and race classes.

Significant race differences in health are observed for four of the nine health measures: IHEIGHT, PFGHEALTH, ALLEG, and TENS. Black children are in worse health than white children according to their parents' assessment of their overall current health (also according to HDBP and ACABN, though for these two the race differences are not statistically significant). Black children are in better health, however, in that they are taller and they exhibit a lower incidence of allergies and tension (favorable differences are also apparent for ABVIS, APERI, and SCHABS, though these are not statistically significant). Race comparisons of children's health based on these

TABLE 1
Definitions of Health Measures

Variable Name	Definition	Source*
PFGHEALTH	Dummy variable that equals one if parental assessment of child's health is poor, fair, or good and zero if assessment is very good	1
IHEIGHT	Height, standardized by the mean and standard deviation of one-year age-sex cohorts	3
ABVIS	Dummy variable that equals one if uncorrected binocular distance vision is abnormal	3
HDBP	Dummy variable that equals one if the child's diastolic blood pressure is above the 95th percentile for his age and sex	3
ALLEG	Dummy variable that equals one if the child has had hayfever or any other kind of allergy	1
TENS	Dummy variable that equals one if the parent rates the child as high strung or moderately tense	1
ACABN	Dummy variable that equals one if the physician finds a "significant" acquired abnormality in examining the child (other than an abnormality resulting from an accident or injury)	3
APERI	Peridontal index, standardized by the mean and standard deviation of one-year age-sex cohorts	3
SCHABS	Dummy variable that equals one if child has been excessively absent from school for health reasons during the past six months	4

*The sources are 1 = medical history form completed by parent, 2 = birth certificate, 3 = physical examination, 4 = school form completed by teacher or other school official.

TABLE 2

Mean Values of Health Measures in Cycle II Sample by Family Income and Race, and Infant Mortality and Birth Weight by Family Income and Race

Cycle II Health Measure	Cycle II Working Sample[a] (n = 4777)	Blacks (n = 581)	Whites (n = 4196)	"F" Statistic for White-Black Difference[b]	Income < \$5,000 p.a. (n = 1645)	Income ≥ \$5,000 p.a. (n = 3132)	"F" Statistic for High-Low Income Difference[b]
PFGHEALTH	.4706	.6127	.4509	54.23	.5939	.4058	158.20
IHEIGHT[c]	.0258	.0900	.0169	2.82	-.1177	.1012	54.07
ABVIS	.1160	.1136	.1163	.04	.0954	.1268	10.33
HDBP	.0557	.0671	.0541	1.65	.0614	.0527	1.56
ALLEG	.1478	.0878	.1561	18.98	.1015	.1721	43.02
TENS	.4593	.3373	.4762	39.92	.4304	.4745	8.44
ACABN	.0373	.0430	.0365	0.61	.0389	.0364	0.19
APERI[c]	-.0392	-.0736	-.0344	1.42	.0711	-.0971	55.88
SCHABS[d]	.0445	.0422	.0449	0.08	.0483	.0426	0.75

Other Health Measures	Total Population 1963-65	Black Population 1963-65	White Population 1963-65		Population with Income < \$5,000 p.a. 1963-65	Population with Income ≥ \$5,000 p.a. 1963-65	
Infant mortality[e]	23.0	39.5	20.8		28.4	19.1	
Percent of births with weight < 2,500 grams	7.87	14.01	7.01		8.89	7.05	

Footnotes to TABLE 2

[a]For description of working sample, see footnote 12.

[b]Critical values for F are 2.69 at 10 percent level of significance and 3.84 at the 5 percent level of significance.

[c]The mean of this variable is not zero because standardization was done using the means and standard deviations for the entire Cycle II sample rather than for our working subsample.

[d]Means derived from subsample of working sample for which a school report was available (n = 4333 rather than 4777).

[e]Deaths per 1,000 live legitimate births. Source: Infant Mortality Rates: Socioeconomic Factors, N.C.H.S. Series 22, No. 14, Table 3, p. 14, U.S. 1964-66.

nine measures, therefore, clearly yield a much less uniform impression than is drawn from inspection of data on infant mortality and low birth weight. Rather than exhibiting the dramatically large health deficits of black infants, older black children are in some ways worse off but also in some ways better off than their white counterparts.[13]

Significant income differences are found for six of the nine health measures, although, as in the case of race differences, the nature of these differences is not uniform. Children from higher income families have significantly better health as measured by PFGHEALTH, IHEIGHT, and APERI (also HDBP, ACABN, and SCHABS although for these three the income differences are not significant). On the other hand, they have significantly poorer health as measured by ABVIS, ALLEG, and TENS.[14] Again, the overall impression conveyed by these data is less clear-cut than that obtained from examining income differences in infant mortality and birth weight: in some cases children from low income families do have poorer health than those from higher income families, but with respect to measures that reflect the "new morbidity" it is the children from low income families who appear to be in better health.

IV. Decomposition of Observed Race and Income Differences

We have documented the fact that race and income differences in health status in the Cycle II sample children are much less sharp than are corresponding differences in measures of infant health. Nevertheless, some differences still do exist. To what extent are these uniquely associated with income and race and to what extent can they be attributed to correlated socioeconomic factors?

A. Race Differences

It is well known that race and income are themselves highly correlated. Thus it is not surprising that the four health measures displaying significant race differences also exhibit significant income differences (see Table 2). An obvious first step, therefore, is to try to determine if these observed race differences are really just a result of differences in income. To do so we obtain mean values for the nine health measures when the Cycle II sample is cross-classified by both income and race (Table 3). Among low income families significant race differences remain for two of the four variables, height and tension. In addition, for APERI the race difference is now significant where it was not before. For all three of these measures, however, black children are found to be in better health than white children from families of comparable low income levels. In high income families, significant race differences still exist for PFGHEALTH, ALLEG, and TENS, with black children in worse health according to PFGHEALTH and in better health according to TENS and ALLEG. Thus, within income classes significant health differences still exist between black and white children. As before, these differences do not uniformly favor children of either race, but most of the significant differences show blacks to be better off.[15]

A further way of investigating the nature of race differences in children's health is to look at residual race differences after a much larger list of socioeconomic variables is held constant. This is done using multiple regression analysis. The dependent variables in the regression equations are the nine health status measures. For the explanatory variables we use a set suggested by the economic model of family investment

TABLE 3

Gross and Net Race Differences in Children's Health Status

Health Measure	Gross Difference (Black Mean-White Mean)	Low Income Families (≤ $5,000 p.a.) Black Mean (n = 418)	Low Income Families White Mean (n = 1,227)	Low Income Families Difference	High Income Families (≥ $5,000 p.a.) Black Mean (n = 163)	High Income Families White Mean (n = 2,969)	High Income Families Difference	Net Difference[a]
PFGHEALTH[c]	.162**	.612	.589	.023	.614	.394	.220**	-.357**
IHEIGHT[c]	.073*	.068	-.181	.249**	.146	.099	.047	.657**
ABVIS[b]	-.002	.108	.091	.017	.129	.127	.002	.009
HDBP[b]	.013	.069	.056	.013	.061	.052	.009	-.003
ALLEG[c]	-.068**	.084	.108	-.024	.098	.176	-.078**	.227**
TENS[b]	-.139**	.354	.456	-.102**	.295	.484	-.189**	-.153**
ACABN[b]	.007	.046	.037	.009	.037	.036	.001	.018*
APERI[c]	-.039	-.063	.117	-.180**	-.101	-.097	-.004	-.443**
SCHABS[b]	-.003	.045	.049	-.004	.034	.043	-.009	-.005

Footnotes to TABLE 3

*,**Significant race differences in means at the 10 percent and 5 percent levels of significance, respectively.

[a]See text for description.

[b]Net difference equals regression coefficient of a race dummy variable (1 = black) from a pooled regression of black and white children that holds constant all other independent variables.

[c]Net difference equals difference in intercepts between black and white regressions with all independent variables held constant.

in children's health described in Edwards and Grossman (1978). Included are family income, parents' educational attainment, whether the child's father lives with the family, whether the child is a twin or a first-born, whether a foreign language is spoken in the home, an indication of the region of residence and size of city of residence, and the sex of the child (the latter is included only for health measures that are not standardized by sex). These variables are defined in detail in Edwards and Grossman (1978).

Race differences in children's health net of differences in this set of socioeconomic variables are presented in the last column of Table 3.[16] In general, the net differences are not smaller than the gross differences. In fact, the net differences are significant for six rather than four of the nine variables, with blacks exhibiting better health for four of the six, and worse health for the remaining two. Specifically, when the above set of socioeconomic variables is held constant, being black is associated with significantly better health for black children when their health is measured according to their parents' assessment, their height, their tension level, and their periodontal index, and with significantly worse health according to the prevalence of allergies and acquired abnormalities. In addition, comparison of these net differences with the gross differences (for all incomes or within income classes) reveals two changes in the health rankings of black and white children: the parental assessment measure now favors blacks and the allergy measure now favors whites.

What conclusions do we draw from the various statistics in Table 3? First, that race differences in children's health do not disappear when income and various other socioeconomic variables are held constant; if anything, they increase. Second, these differences do not obviously favor children of either race. As to the reasons for these differences, one can speculate about the roles of such factors as differential genetic endowments (in the case of height or the periodontal index, for example) and differences in tastes or in life styles.

B. Income Differences

Race differences in childrens' health did not disappear when various socioeconomic factors (including income) were held constant; does the same conclusion hold for income-related differences? Put differently, to what extent do the gross differences in health status between income classes disappear when additional socioeconomic factors are held constant? To answer this question, we use the same type of multiple regression analysis described earlier. We simplify the analysis, however, by restricting the decomposition of gross income differences to the white sample only.[17]

Gross and net income differences for the nine health measures are presented in Table 4. The "net" income differences are computed similarly to the corresponding race differences[18] and should be interpreted as the difference in mean health status between the two income classes if all of the socioeconomic variables (other than income, of course) took the same values in both classes. The number of health status measures for which significant income differences exist is reduced to four when related socioeconomic factors are held constant. For three of the four, PFGHEALTH, IHEIGHT, and APERI, low income is associated with significantly poorer health; for the fourth, ALLEG, it is associated with better health. In addition, the magnitude of these differences is substantially reduced, with the net differences being typically less than half of the gross differences (see last column of table). For example, on the basis of the

TABLE 4

Gross and Net Income Differences in the Health Status of White Children[a]

Health Measure	High Income Mean	Low Income Mean	Gross Income Difference[b]	Net Income Difference[c]	Ratio of Net to Gross Income Difference
PFGHEALTH	.394	.589	-.195**	-.072**	.37
IHEIGHT	.099	-.181	.280**	.117**	.42
ABVIS	.127	.091	.036**	.020	.56
HDBP	.052	.056	-.004	-.001	.25
ALLEG	.176	.108	.068**	.028*	.41
TENS	.484	.456	.028*	-.009	d
ACABN	.036	.037	-.001	-.004	2.00
APERI	-.097	.117	-.214**	-.077**	.36
SCHABS	.043	.049	-.006	-.001	.17

[a]There are 2,718 white children in the high-income (≥ $5,000 p.a.) sample and 1,227 white children in the low-income (≤ $5,000 p.a.) sample.

[b]This is computed as the mean in the high income sample minus the mean in the low-income sample.

[c]This is the coefficient of a dummy income variable (high-income children have value of one) in a multiple regression which includes variables listed in text.

[d]Not computed because of change in sign.

*,**Significant income differences at the 10 percent and 5 percent levels of significance, respectively.

gross difference, about 20 percent more of the high income parents than of the low income parents assessed their childrens' health as very good. When related socioeconomic factors are held constant, this difference is reduced to only 7 percent. Thus, although income differences in health status still do exist, their magnitudes are greatly diminished when related factors are held constant. The main conclusion to be drawn is clear: gross income differences in health greatly overstate the true relationship between family income and health.

Further insight about the nature of gross income differentials in health status is obtained by studying the precise role of the explanatory socioeconomic variables. Table 5 presents calculations which illustrate how the gross income differences are decomposed among the various explanatory factors for the six health variables exhibiting significant gross income differences. The procedure is simply to multiply the coefficients of these explanatory variables by the differences in their mean values in the high and low family income samples of children.[19] Several results in Table 5 are noteworthy. First, almost all of the differences in the six health measures between the high and low income subsamples can be accounted for by differences in the independent variables that we have included in our empirical work. Second, a detailed examination of the decomposition indicates that for four of the six measures (PFGHEALTH, IHEIGHT, ALLEG, and APERI), differences in parents' average schooling between high and low income families account for as much or more of the gross differences as does income itself. For the other two measures, ABVIS and TENS, no single component accounts for a large part of the gross differences, but rather many components play small roles.

TABLE 5

Components of the Difference in PFGHEALTH, IHEIGHT, ABVIS, ALLEG, TENS and APERI Between White Children from High and Low Income Families

Component	PFGHEALTH	IHEIGHT	ABVIS	ALLEG	TENS	APERI
Family income	-.072	.117	.020	.028	-.009	-.077
Parents schooling	-.089	.126	.002	.045	.005	-.145
Other family characteristics[a]	.000	.009	.004	.004	.012	-.011
Characteristics of child[b]	-.013	.008	.000	.001	.007	.001
Region	-.024	.010	.007	-.005	-.002	.020
City size	-.006	.009	.004	-.004	.016	-.003
Total = Predicted Gross Difference	-.205	.279	.037	.069	.029	-.215
Actual Gross Difference	-.195	.280	.036	.068	.028	-.214

[a]These include whether or not a foreign language is spoken in the home and whether or not the father is absent from the home.

[b]These include whether or not the child is a first-born or a twin, and his or her sex. The latter is not included for IHEIGHT and APERI, both of which are standardized by sex.

Our findings with respect to race and income differences may be compared with those in a recent study of infant mortality by Gortmaker (1977). He attempts to determine what portion of the large income and race differences in infant mortality can be explained by differences in parents' educational attainment, mother's age, the child's birth order, and the previous pregnancy experience of the mother. He finds that poverty families and black families still display a much higher incidence of infant mortality even when these factors are controlled for.

V. Conclusions

The first point that we make in concluding is that income and race differences in infant mortality provides a poor, and even misleading description of income and race differences in the health of older children. It may be appropriate to use infant mortality statistics in broad across-country comparisons of the health status of various populations but these statistics should not be used to indicate the health status of various groups of older children within the United States.

We do find differences in the health status of black and white children and of children from high and low income families, but these differences by no means overwhelmingly favor the white or high-income children. With respect to differences by race, whether or not they are adjusted for differences in associated socioeconomic factors, black children in many cases are in better health than their white counterparts. In the case of income differences in health, the high income children do appear to be in better health according to most measures, but their advantage is greatly diminished when one controls for related socioeconomic factors like parents' educational attainment. Even so, for measures relating to the new morbidity children from higher income families are in worse health. Of course, one could argue that the latter conclusion is erroneous because health problems like allergies and excessive tension are comparatively subtle and are detected only in a setting (i.e. in high income families) where other types of health problems are minimized. However, the greater incidence of the new morbidity among children from high as opposed to low income families is consistent with the well known positive relationship between income and morbidity and mortality rates observed for adults in the United States [for example, Auster et al. (1969) and Grossman (1975)].

Implicit in the above discussion is the necessity of recognizing the multidimensional nature of health. Our results clearly differ for different health status measures. Poor and black children tend to be in better health when aspects of the "new morbidity" are under study, and in worse health when more traditional health measures are used. Thus, our findings underscore the importance of treating childrens' health status as multidimensional and illustrates how the use of a single health index could lead to erroneous conclusions about health status and its relation to income and race.

The primary focus of this paper has been to clarify commonly held notions about income and race differences in childrens' health. Our analysis, however, has also raised two important and as yet unanswered questions. The first relates to our finding that race differences in childrens' health still exist even after a host of socioeconomic factors are held constant. What are the causes of these differences and what do they mean? The second arises out of the divergence between infant mortality statistics and our mid-childhood health measures. Why are the income and race differences in infant mortality so striking when corresponding differences in mid-childhood morbidity are not? This divergence is not simply a result of the type of measure (mortality versus morbidity); differences in the mortality of older children are also less striking. Perhaps the health differences of various demographic groups are minimized in the mid-childhood years. If so, we need to know why. The answers to these questions are clearly pertinent to the conduct of public policy towards the welfare of children.

FOOTNOTES

[*]Associate Professor, Queens College of C.U.N.Y. and Professor, Graduate Center of C.U.N.Y., respectively. Research for this paper was supported by PHS Grant No. 1 R01 HS 02917 from the National Center for Health Services Research to the National Bureau of Economic Research and by a grant from the Robert Wood Johnson Foundation to the NBER. We are indebted to Ann Colle and Steve Jacobowitz for their research assistance and comments.

[1]A full description of the sample, the sampling technique, and the data collection is presented in NCHS (1967). The one deficiency of this sample from the point of view of studying children's health is the exclusion of children in institutions. To the extent that these children are more likely to have serious and disabling physical conditions, the reported incidence of certain conditions will be lower in our sample than in the entire population of children. In addition, if the probability of the institutionalization of a child with a given condition depends on income and race, our results will incorporate unknown biases. The number of institutionalized children is small, however, at about four-tenths of a percent of all children aged 5 through 13 years. [This is the proportion of 5-13 year-olds living in "group quarters" in 1970 according to the U.S. Bureau of the Census (1973), Tables 52 and 205. The corresponding percentages by race are .38 percent for whites and .7 percent for blacks.]

[2]See, for example Sullivan (1966), Berg (1973), and, more recently, Ware (1976).

[3]See Grossman (1972), p. 58. This definition is also very similar to that proposed in Torrance (1976).

[4]Of course, there is a positive relationship between "permanent" and "transitory" health status in the sense that a child with low health capital is more likely to contract some acute conditions and to have them for a more extended time period. For example, Birch and Gussow (1979) discuss how nutrition (which is clearly a determinant of "permanent" health status) and disease are intimately related.

[5]In earlier work some attempts were made to condense the health information using principal component analysis. The analysis yielded almost as many equally weighted components as there were initial health measures.

[6]The studies we consulted are: Wallace (1962); Mechanic (1964); Mindlin and Lobach (1971); Talbot, et al. (1971); Kaplan et al. (1972); Hu (1973); Starfield (1977); Kessner (1974); Haggerty et al. (1975); and Inman (1976).

[7]The following physicians gave us extremely helpful advice: John McNamara, M.D., then Assistant Professor of Public Health and Pediatrics at Columbia University School of Public Health and Associate Commissioner in the New York City Department of Health; Roy Brown, M.D., Associate Professor of Community Medicine and Pediatrics at the Mount Sinai School of Medicine of the City University of New York; Thomas Travers, D.D.S., Director of Ambulatory Care in the New York City Department of Health; and Ruth T. Gross, Professor of Pediatrics and Director of Ambulatory Pediatrics, Stanford University Medical Center, Stanford, California.

[8] If the actual height of each age-sex group is normally distributed, IHEIGHT can be translated directly into the child's height percentile.

[9] In defining ACABN, we exclude abnormalities resulting from accidents or injuries because these are likely to reflect transitory rather than permanent health variations.

[10] The periodontal index suffers from the defect that it is subject to intra-rater and inter-rater variability. We have experimented with a somewhat more objective measure of oral health, the number of decayed permanent and primary teeth adjusted for age and sex, and have obtained results similar to those for the periodontal index. Compared to the number of decayed teeth, the periodontal index reflects more serious oral health problems.

[11] There is no school form for approximately 500 children in the Cycle II data set. Since excessive absence due to illness is the only variable taken from the school form, children without the school form are eliminated from our working sample only when school absenteeism is examined.

[12] These means are computed using only 4,777 of the 7,119 observations because our working sample only includes children who lived either with both of their parents or with their mothers only (no step-parents, foster parents, grandparents, etc.). In addition, the 72 children who turned 12 years old after having been chosen fro the Cycle II survey are excluded as well as those children for whom there were missing data on either these health measures or on the socioeconomic variables used in the next section. Comparison of these means with corresponding means for the entire Cycle II sample reveals that there is very little difference between the full sample and our working subsample.

[13]This difference between the relative health profile of blacks in infancy and in midchildhood is not simply a result of differences in data sources or differences between sample data and population data. Available data on the Cycle II children during their infancy (birth weight, the incidence of congenital abnormalities, and the parents' retrospective assessment of the infant's health) indicates that the black children had significantly poorer health in infancy.

[14]Income differences were also computed for an all-white sample with virtually identical results (see Table 4). Thus, these reported income differences in health are not the result of the higher proportion of blacks in poor families.

[15]These results can again be contrasted with comparable data for the two infant health measures discussed earlier. Even within income classes, race differences in infant mortality and in the incidence of low birth weight remain large and consistently favor whites:

	Low Income ($5,000 p.a.)		High Income ($5,000 p.a.)	
	Blacks	Whites	Black	Whites
Infant mortality	43.9	24.2	23.6	18.6
Incidence of low birth weight	13.2	7.6	17.1	6.6

(Source and definitions of health measures are the same as in Table 2).

[16]Net differences are computed in two different ways depending on whether or not there are significant race differences in slope coefficients in the underlying health equations. If there are no significant differences in the slope coefficients by race (as in the case for the dependent variables HDBP, ABVIS, TENS, ACABN, and SCHABS), the "net" race difference is represented by the regression coefficient of a race dummy variable (black = 1) from a pooled regression of black and white children that holds constant all other dependent variables. In this case, the "net" difference is that portion of the gross difference that remains after holding constant differences in the mean values of the explanatory variables. When there are significant race differences in the slope coefficients (as in the case of the dependent variables APERI, IHEIGHT, PFGHEALTH, and ALLEG), the net differences is computed as the difference in intercepts from race-specific regression estimates with the set of explanatory variables held constant. In this case the net difference represents that portion of the gross race difference that remains after allowing for race differences in both means and in slope coefficients.

[17]The list of health measures for which there are significant income differences is the same for the white sample as it is for the full black and white sample reported on in Table 2.

[18]Unlike in the case of race differences in no cases were there significant references in the slope coefficients in the two income classes.

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