Socioeconomic Effects on Child Mortality In the United States

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Abstract: Despite considerable reason for scholarly and policy interest in socioeconomic mortality differentials, socioeconomic effects on child and teenage mortality in the United States have been a neglected research topic because of severe data limitations. Exploiting data obtained for other purposes, this paper reports socioeconomic effects on the mortality of children and teenagers. Socioeconomic mortality differentials among children are large—at least as large as those among adults. The major source of socioeconomic mortality differences among children is apparently differential risk to accidental death. Within the child population, the strength of socioeconomic effects varies directly with the relative importance of accidents as a component of overall mortality. (*Am J Public Health* 1982; 72:539–547.)

Introduction

In most populations for which mortality data are classified by the education, occupation, income, or social class of the deceased, persons from higher socioeconomic groups experience lower mortality. Mortality differentials among socioeconomic groups show the potential for future mortality reduction since a reallocation of social and economic resources may reduce mortality of all groups to the level of the most advantaged groups.[1–5] Although socioeconomic differentials in adult and infant mortality in the United States are well documented,[6–8] socioeconomic variation in mortality of persons aged 1–20 years has received little attention. Apart from analyses of aggregate areal data,[9] there has been little research of socioeconomic effects on the mortality of children and teenagers. Except for England and Wales, socioeconomic effects on child mortality has been a neglected topic throughout the developed world.[2–4] For the United States, this results from the absence of data on the socioeconomic status and mortality of children. No socioeconomic information is included on the death certificates of children (except for some older teenagers whose "usual occupation" is reported); nor have children's death certificates been linked to census information on family socioeconomic conditions. High-quality data on family socioeconomic characteristics for a sample of deceased and living children are needed.* But because child deaths are relatively rare, such data are costly. Until funds are available for mounting such an effort, limited available data must be exploited.

This paper reports analyses of socioeconomic differentials in mortality of persons under age 20 in the United States. Exploiting a neglected source, the June 1975 Current Population Survey (CPS), which obtained women's accounts of the survival status of their children, it reports child mortality estimates specific to the educational attainment of children's mothers and to the income of their families and compares the strength of socioeconomic mortality differentials among children and teenagers to those observed for adults in the 1960 Matched Records Study.[7] The paper shows that the strength of socioeconomic differentials in child mortality varies among subgroups of the under-20 population with the importance of accidents as a cause of death.

Sources of Socioeconomic Effects

Socioeconomic differentials in survival rates arise from many sources, reflecting differences in: risks in the workplace; diet, housing, recreation, and clothing; access to health care; and ability to prevent or respond to medical crises because of differences in education and access to health information. The processes that generate mortality differences among socioeconomic groups would be complex to describe even were detailed life histories of the deceased to be recorded. Since such data are scarce, the empirical examination of the *reasons* for socioeconomic mortality differences has been limited.[4]

Insight into socioeconomic mortality variation can nontheless be obtained from information on how major *causes* of death vary in the extent to which they are related

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*Decedents under age 20 in the 1960 Matched Records Study were matched to their individual census records, but no attempt was made to link family socioeconomic information from the census to the children.[7] The data permitting such a linkage have not been retained. The 1962–63 National Mortality Survey included deceased children, but the sample is too small to permit reliable estimates of differentials.[10] The Inter-American Investigation of Mortality in Childhood obtained the socioeconomic characteristics of deceased children under age 5 in San Francisco and surburban California in 1969.[11] But these data lack comparable socioeconomic distributions for surviving children in the population.

TABLE 1—Percentages of All Deaths Resulting from Major Causes, England and Wales (1970–72) and United States (1975) and Class Differences in Mortality, England and Wales (1970–72), for Children Aged 1–14

Sex / Cause of Death	Percentage of All Deaths England & Wales 1970–72	Standardized Mortality Ratios by Occupational Class, England & Wales, 1970–72*						SMR(V) / SMR(I)	Percentage of all Deaths, United States 1975
		I	II	IIIn	IIIm	IV	V		
Boys									
All causes	100.0	74	79	95	98	112	162	2.19	100.0
Neoplasms	15.9	99	103	125	98	96	135	1.36	11.2
Respiratory	12.5	101	66	101	105	108	136	1.35	5.4
Congenital anomalies	11.7	76	100	91	104	123	114	1.50	7.0
Accidents, poisonings, and violence	38.6	44	67	76	92	114	208	4.73	56.4
Other	21.4								20.0
Girls									
All causes	100.0	89	84	93	93	120	156	1.75	100.0
Neoplasms	16.7	104	107	124	98	102	117	1.13	13.0
Respiratory	15.5	87	83	79	96	135	150	1.72	7.5
Congenital anomalies	15.6	102	90	105	94	123	101	.99	10.4
Accidents, poisonings, and violence	26.0	63	66	72	84	120	214	3.40	43.7
Other	26.2								25.4

SOURCES: Office of Population Censuses and Surveys: Occupational Mortality. Series DS, No. 1. London: Her Majesty's Stationery Office, 1977.
US Department of Health, Education, and Welfare: Vital Statistics of the United States 1975, Vol II, Mortality, Part A. Hyattsville, MD: DHEW, PHS, NCHS, 1979.

*Occupational Classes are: I—professional; II—managerial and lower professional; IIIn—skilled nonmanual; IIIm—skilled manual; IV—partly skilled; V—unskilled.

SMR(V) / SMR(I)

to socioeconomic status. Although unavailable for the United States, such information is obtainable for England and Wales where fathers' occupations are reported on children's death certificates.

Table 1 shows the distribution of causes of deaths of children aged 1–14 in England and Wales in 1970–72 and the United States in 1975, and standardized mortality ratios by occupational class for England and Wales.[12] By far the biggest component of child mortality in both England and Wales and the United States is death from accidents, poisonings, and violence. Further examination of this category shows that it comprises mainly mortality from motor vehicle-related accidents both to pedestrians and motor vehicle passengers. Although death rates from all causes are inversely associated with occupational class, the association is much stronger for accidents than for other major causes, suggesting that differences in access to safe recreational areas, in exposure to hazardous driving conditions, and, for the younger children, in parental vigilance are important sources of child mortality variation among socioeconomic groups.

This suggests that groups for whom accidental deaths constitute a higher proportion of total deaths exhibit stronger socioeconomic differentials. Socioeconomic differentials should be stronger for males than for females, for Blacks than for Whites (at some age groups), and for teenage children than for younger children, reflecting the fact that men, Blacks, and teenagers have higher proportions of deaths from accidents. Socioeconomic differentials for children may be stronger than for adults because of the greater importance of accident mortality among children than among adults. In 1975 the proportion of deaths resulting from accidents in the United States increased from 40 per cent for children aged 1–4 to a maximum of 56 per cent for youths aged 15–19 and then declined sharply with age, averaging only 14 per cent for the 20–65 age group.[13]

Materials and Methods

The estimates of socioeconomic differentials in child mortality reported in this paper are based upon the June 1975 CPS, a survey of approximately 45,000 households in the US civilian noninstitutional population. The survey obtained fertility histories for ever-married women aged 75 and under and a subsample of single women aged 18 to 75. The women were asked their numbers of children ever born and, where applicable, the date of birth, sex, and current location of their first three and last two children.[14] For up to five of the women's children, information on location was obtained through the question: Where does the child live now?

Child resides in this household .... o
Child resides elsewhere:
  in (his/her) own household .... o
  with relatives: Grandparents .... o
    Father .... o
    Other .... o
Child deceased.............................. o
Don't know................................ o

Thus the survey provides direct responses on the survival status of up to five children for each woman. Respondents reported date of birth and location of approximately 77,000 children, of whom 3,000 had died. Many children, however, were born to women who were at advanced ages in 1975 and thus may have died well past childhood. Of the 77,000, 40,290 were born less than 20 years before June 1975 and, of these, 780 were reported deceased. These 780 observations, in concert with living children aged less than 20 in 1975, are the basic observations for the analysis.

Women did not report the dates of death for deceased children, but rather whether or not the child was dead in June 1975. It is impossible to calculate age-specific death rates directly from the data. Since the child's birth date is obtained, however, the survey measures whether or not the child has died by a specifiable age and, in the aggregate, measures the proportion of children surviving to a specific age interval. The principal mortality measure used in this analysis is the percentage of children born a given number of years prior to June 1975 who have died by June 1975. This measure, which can be estimated directly from the data, summarizes the mortality of a cohort from its birth until the survey date. Although it does not measure directly age-specific mortality, the measure permits inference about the age pattern of mortality levels and differentials because the cohorts of children observed in the June 1975 CPS differ in the span of ages that they have experienced.** Although the proportion of children surviving until June 1975 is used for most of the analysis, for comparing child and adult socioeconomic mortality differentials, probabilities of dying between successive ages are also inferred using procedures discussed below.

Analyses reported elsewhere[15] examine the quality of the June CPS mortality data. For White respondents, proportions dying are underestimated in the CPS by approximately 25 per cent, which is similar to matching failure rates in major matching studies for adult mortality.[6,7] For Blacks, however, the CPS underestimates survival proportions by approximately 50 per cent. Such serious underestimates of mortality in these data may arise in part from the underrepresentation of births in large families in the data, from the exclusion of orphans from the data, and from reliance on only a single question to establish mortality. Estimated mortality differentials may be attenuated by undercount. Some evidence that this is the case is that mothers who are high school graduates are less likely to respond that they "Don't know" where their children are than mothers who are high school dropouts. However, it is impossible to know how seriously differential reporting of deaths affects estimated differentials. For children generally, but especially for Blacks, the results reported here should be interpreted with caution.

**In life table notation, this measure is $100\,(1 - {}_nL_x/n\ell_0)$ where ${}_nL_x$ is the number of persons aged x to x + n in the life table population and ℓ_0 is the radix of the life table. The ${}_nL_x$ calculated for various age intervals, however, are not a life table population for a period or a cohort because each ${}_nL_x$ is based on a unique sequence of age-specific death rates over the x to x + n years prior to the survey.

The CPS provides socioeconomic information on women reporting fertility histories and on their households, including educational attainments, occupations, and labor force statuses of household members, and total family income. The CPS measures pertain to June 1975 and may have changed significantly over the lifetimes of children reported by the women. Family income in 1975, for example, may poorly measure average family economic conditions experienced by children born in 1960 and provide an unsound basis for estimating the association between economic welfare and child survival. The analyses, therefore, focus on the relationship between mother's schooling (measured in grades completed) and child mortality because adult educational attainment is typically stable and measures average socioeconomic conditions experienced during childhood.[6] Since schooling measures different aspects of socioeconomic status from occupational, income, or labor force measures, and may not reflect all family socioeconomic circumstances that differentially affect mortality, mortality differentials by total family income for those families that reported their income are also presented, but these are less reliable estimates than those by mother's schooling.

Results

Schooling and Income Effects

Table 2 reports percentages of children dead by years since birth, race, sex, and mother's schooling. For most age-race-sex groups percentages of children dead differ substantially by mother's schooling. For example, among White boys whose mothers are high school dropouts, 3.36 per cent have died by age 10–14 in contrast to 1.94 per cent for boys whose mothers are high school graduates. Because the sample of deaths is small, mother's schooling is dichotomized. More detailed educational classifications (available from the author on request) suggest that mortality declines monotonically from low to high levels of mother's schooling but that the sharpest contrast is between children of high school graduates and those whose mothers attend but do not complete high school. Advantages to children of better-educated mothers occur at every age for Whites and for Black males, but differentials are minimal for Black females. The Black percentages, however, are based on very few deaths (47 for males and 52 for females). Education differentials are apparently stronger for boys than for girls, a speculation borne out by statistical tests (not shown here).

The relative size of socioeconomic differentials among age-race-sex groups is measured more precisely in the penultimate column of Table 2, which reports the logarithm of the odds ratio of dead to living children between mother's schooling categories.*** Large values of $\ln\alpha$ imply a larger disadvantage to children of high school dropouts. This measure is invariant under changes in mortality *levels* or proportions of mothers in each education group,[16] and thus

***For example, $\ln\alpha$ for White boys born 0–4 years before 1975 is $\ln[1.94/(100 - 1.94)]/[1.53/(100 - 1.53)]] = .24$.

TABLE 2—Percentages of Children Dying by June 1975 and Number of Births by Mother's Schooling, Years between Birth and June 1975, Race, and Sex and Associations between Mother's Schooling and Child Mortality (lnα)

Race and Sex	Years between Birth and June 1975	Mother's Schooling: Less Than 12 Grades — Number of Births	Less Than 12 Grades — Percentage Dead	12 Grades or More — Number of Births	12 Grades or More — Percentage Dead	lnα*	Standard Error of lnα
White Males	0–4	1034	1.94	3018	1.53	.24	.27
	5–9	1172	2.98	3173	1.96	.43	.21
	10–14	1429	3.36	3441	1.94	.56	.19
	15–19	1547	3.81	3528	2.18	.59	.17
White Females	0–4	970	1.24	2816	0.99	.22	.35
	5–9	1134	1.85	3059	1.34	.33	.27
	10–14	1399	1.79	3426	1.52	.17	.24
	15–19	1428	2.31	3304	1.66	.33	.22
Black Males	0–9	427	2.34	638	1.41	.52	.46
	10–19	621	3.22	532	1.50	.78	.42
Black Females	0–9	405	1.72	643	2.18	−.24	.47
	10–19	579	2.94	567	2.47	.18	.37

*$\alpha = n_{dl}n_{ah}/n_{dh}n_{al}$ where n_{dl}, n_{ah}, n_{dh}, and n_{al} denote numbers of children dead for low-education mothers, alive for high-education mothers, dead for high-education mothers, and alive for low-education mothers respectively. ($-\infty < \ln\alpha < \infty$). $\ln\alpha = 0$ signifies no association. See Fienberg.[16]

permits comparisons among groups with differing average mortality and mother's education. The lnα show that mortality differentials by mother's schooling are stronger for boys than for girls and suggest that for boys the association is stronger with respect to survival to the teenage years than for survival up to age 10. The last column of the Table shows large sample standard errors for lnα. Few of the simple associations between schooling and mortality are by themselves statistically significant, but global effects of mother's schooling on mortality are highly significant, providing clear evidence of socioeconomic effects on children's survival chances.

An alternative socioeconomic indicator is annual family income, which may index familial access to health care and environmental safety more strongly than maternal schooling. Table 3 reports percentages of children dead by annual

TABLE 3—Percentages of Children Dying by June 1975 and Number of Observations by Annual Family Income, Years between Birth and 1975, Race, and Sex and Associations between Income and Mortality (lnα)

Race and Sex	Years Between Birth and June 1975	Annual Family Income: Less than $10,000 — Number of Births	Less than $10,000 — Percentage Dead	$10,000 or More — Number of Births	$10,000 or More — Percentage Dead	lnα*	Standard Error of lnα
White Males	0–4	1530	2.09	2357	1.40	.41	.25
	5–9	1245	2.89	2878	1.95	.41	.22
	10–14	1282	3.51	3307	2.03	.56	.19
	15–19	1156	3.98	3524	2.33	.55	.19
White Females	0–4	1440	1.11	2196	1.05	.06	.33
	5–9	1253	2.15	2732	1.21	.59	.26
	10–14	1207	1.83	3314	1.51	.19	.26
	15–19	1100	2.27	3276	1.74	.27	.24
Black Males	0–9	659	2.28	380	1.05	.78	.57
	10–19	699	2.72	398	1.76	.44	.45
Black Females	0–9	692	1.44	326	3.38	.87	.44
	10–19	742	2.16	353	3.40	−.47	.39

*$\alpha = n_{dl}n_{ah}/n_{dh}n_{al}$ where n_{dl}, n_{ah}, n_{dh}, and n_{al} denote numbers of children dead in low-income families, alive in high-income families, dead in high-income families, and alive in low-income families respectively.

TABLE 4—Percentages of White Children Dead by Total Family Income, Mother's Schooling, Years since Birth, and Sex

Sample	Mother's Schooling	Annual Family Income: Less than $10,000	$10,000 or More	Total
Males 0–9	<12	2.16	2.14	2.15
	≥12	2.09	1.62	1.74
	Total	2.45	1.70	1.96
Males 10–19	<12	4.64	2.87	3.68
	≥12	2.75	1.99	2.13
	Total	3.74	2.18	2.59
Females 0–9	<12	1.54	1.69	1.60
	≥12	1.77	1.04	1.23
	Total	1.67	1.13	1.32
Females 10–19	<12	1.98	2.16	2.08
	≥12	2.10	1.48	1.59
	Total	2.04	1.63	1.74

family income in 1974, years since birth, race, and sex. Income is dichotomized, but more detailed tabulations suggest that the income-mortality relationship is monotonic. Mortality differentials by family income are similar to those for maternal schooling. Higher income children have an advantage for all race-sex groups except Black girls and a stronger advantage for boys than for girls. Compared to the schooling differentials, however, there is less tendency for socioeconomic differentials to increase with age among boys, a possible consequence of family income being a less reliable index of socioeconomic conditions experienced by older children than of those experienced by younger children. Despite the measurement unreliability of income, however, clear socioeconomic differentials appear for most groups, and economic effects are as strong as those of mother's schooling.

In principle, family income indexes economic influences on child mortality whereas mother's schooling measures a more general set of family influences. To see whether either has a predominant influence, consider the effects of income and education simultaneously. Table 4 shows percentages dead by sex and ten-year age intervals by both family income and mother's schooling for White children. The statistical significance of the patterns shown in Table 4 can be shown by goodness of fit statistics for alternative models fitted to the frequencies from which Table 4 was calculated. For each of the four age-sex groups, four models are fit to the data: 1) no effect of either mother's schooling or family income on child mortality; 2) effect of schooling only; 3) effect of income only; 4) effect of both schooling and income. The χ^2 statistics for these models, shown in Table 5, indicate the relative fits of these alternative hypotheses. Low values of χ^2 for a model (relative to its degrees of freedom) signify that the data correspond closely to it. Conversely, large values of χ^2 indicate a lack of correspondence between model and data.[16]

For boys, schooling and income clearly have independent effects on mortality. The very low value of χ^2 for a model of additive effects of both schooling and income (one degree of freedom) indicates no three-way interaction among schooling, income, and mortality, but that the schooling and income effects together fit the data much better than either effect alone. For females, the results are less clear. Girls with both high school graduate mothers and higher income families have lower mortality than girls with either low income or low maternal schooling. The apparent reversals of socioeconomic mortality differences within the low education or low income groups are not statistically significant. The χ^2 values for females do not imply that any single model fits the data better than the others. The test statistics suggest a possible three-way interaction as reflected in the unusually low mortality for girls advantaged on both mother's schooling and income. But the only clear implication of these results is that all socioeconomic effects are weaker for females than for males.

A possible source of bias in the socioeconomic mortality differentials reported here is that the differentials arise from the association of socioeconomic status with other social factors that may affect mortality. In particular, mother's schooling and family income are associated with the age of the mother and the average birth order of children, both of which affect the probability of infant death and may affect the mortality of older children as well.[8] Further multivariate analysis of the June 1975 CPS data (not shown here) shows that proportions of children dying before June 1975 are in fact higher for higher order births than lower order births and higher for children born to teenagers and to women past their mid-thirties.‡ When these variables are controlled, however, the socioeconomic differences in child mortality reported here are not substantially reduced.

‡These results will be reported in detail elsewhere.

TABLE 5—Goodness of Fit Statistics for Effects of Mother's Schooling and Annual Family Income on Child Mortality by Age and Sex for Whites (Tests are based on Table 4)

Sample (N)	Model	Likelihood Ratio χ^2	d.f.	probability
Males 0–9	No effect	8.10	3	.04
(8014)	Schooling only	2.57	2	.28
	Income only	2.95	2	.23
	Schooling and income	0.02	1	≥.50
Males 10–19	No effect	26.19	3	.00
(9269)	Schooling only	8.52	2	.01
	Income only	10.22	2	.01
	Schooling and income	0.33	1	≥.50
Females 0–9	No effect	6.22	3	.10
(7622)	Schooling only	4.67	2	.10
	Income only	2.51	2	.29
	Schooling and income	2.09	1	.15
Females 10–19	No effect	4.86	3	.18
(8898)	Schooling only	2.24	2	.33
	Income only	3.17	2	.21
	Schooling and income	1.50	1	.22

Comparison of Adult and Child Differentials

There are clear socioeconomic influences on child mortality. But how extreme are these inequalities? In particular, how do patterns for children compare to those for adults who exhibit pronounced socioeconomic differentials? Child mortality differentials may be at least as strong as those for adults. As noted, accident mortality is a larger component of total mortality for children and teenagers than for adults, and socioeconomic mortality differentials from accidents are stronger than for any other cause among children in England and Wales and among adult males in the United States.[6,17] This conjecture is difficult to investigate because socioeconomic mortality differentials cannot be observed for all ages from a single data source. In addition, the meaning of socioeconomic status changes over ages: whereas a child's socioeconomic standing is best indexed by parental characteristics, adults' standing is best indexed by their own socioeconomic characteristics, and, for teenagers, the proper index is unclear. Adult and child socioeconomic differences for Whites can nonetheless be compared using mortality information from the June CPS for children (specific to mother's schooling) and from the 1960 Matched Records Study for adults (specific to their own schooling). Life tables specific to schooling level are available for White adults from Census and Matched Records Study data.[6,28] From these, a suitable age-specific mortality index can be obtained, namely the probability that an individual dies between ages x and x + n ($_nq_x$). Such a measure cannot be calculated directly for children but can be inferred from the CPS-based percentages dying by the survey date that are reported above [$100(1 - {}_nL_x/n\ell_0)$] and age patterns of mortality in Model Life Tables.[19] The $_nq_x$ for children specific to mother's schooling are estimated by adjusting the CPS mortality percentages for undercount of children's deaths and using the adjusted percentages to select Model Life Tables which provide the corresponding age-specific probabilities of death ($_nq_x$). The age-specific probabilities of death estimated for children afford not only meaningful comparisons with adult mortality, but also a check on the existence of socioeconomic mortality differences for children who survive infancy. Because the percentages of children surviving until the survey date reflect deaths at all ages between birth and 1975 they conflate mortality to infants and older children. The age-mother's schooling-specific death probabilities, however, are estimates of mortality *within* age intervals that are consistent with the observed data. Although these are indirect estimates they can demonstrate more clearly the extent of socioeconomic differentials after infancy.

Table 6 reports the estimated probabilities, including measures of association (lnα) between mortality and schooling specific to age and sex. For each sex-schooling group the death probabilities conform to the typical age pattern of mortality, low mortality during childhood relative to infancy and adulthood. At all ages, however, higher schooling groups exhibit lower mortality, consistent with the analyses reported above and previous analyses of the adult data.[6] In simple differences between death probabilities, the largest contrast is between education-specific mortality probabilities at the oldest ages. But these differences reflect the higher mortality of older persons and the greater variance of probability measures toward the center of the (0,1) interval. A preferred measure of socioeconomic differentials is lnα, which is invariant under changes in mortality levels. For males, the negative effect of schooling on mortality exhibits a curvilinear pattern in lnα, which peaks for teenagers and young adults and is lower for the youngest children and older

TABLE 6—Estimated Probabilities of Dying ($_nq_x$) between Selected Ages by Sex and Schooling and Associations (lnα) between Schooling and Mortality, US Whites*

Age	Males $_nq_x \times 100$			Females $_nq_x \times 100$		
x to x + n	<12	≥12	lnα‡	<12	≥12	lnα‡
0–5	2.54	1.98	.319	1.86	1.48	.278
5–10	0.32	0.20	.469	0.19	0.13	.409
10–15	0.31	0.18	.561	0.16	0.13	.197
15–20	0.59	0.36	.512	0.29	0.20	.378
25–35	2.24	1.30	.554	1.25	0.86	.378
35–45	4.38	2.71	.497	2.46	1.68	.389
45–55	9.78	7.68	.265	4.90	3.93	.231
55–65	21.05	18.30	.174	12.06	8.51	.388
65–75	40.26	38.12	.090	26.53	21.65	.268

*$_nq_x$ denotes the probability of dying between exact ages x and x + n conditional on survival to age x. Estimates for x = 0, 5, 10, 15 were computed using percentages dead reported in Table 2 adjusted for undercount[15] to interpolate between model life tables.[19] Model "West" tables were used in all cases. Estimates for x = 25, 35, 45, 55, 65 were computed from age-sex-schooling specific death rates estimated from the 1960 Matched Records Study.[6,18] For ages 0–20 "schooling" refers to mother's schooling; for ages 25 and over it refers to individual's own schooling.

‡$\alpha = [_nq_x^{<12}(1 - {_nq_x^{\geq 12}})] / [(1 - {_nq_x^{<12}}) ({_nq_x^{\geq 12}})]$. lnα = 0 denotes no association ($-\infty < \ln\alpha < \infty$).

adults. Socioeconomic mortality differences, therefore, are very large in late childhood relative to those at other ages. For women, socioeconomic mortality differences are, on average, smaller than for men and approximately uniform throughout life. The pattern for women suggests that the role of accidents in mortality levels and differentials is less important for women than for men. For women, accidents constitute a lower proportion of deaths at all ages and are less strongly related to socioeconomic status than they are for men.[6,13] For females as well as males, however, socioeconomic mortality differentials for children and teenagers are as strong as those for adults.

Accidental Death and Socioeconomic Differentials

Underlying the interpretation of socioeconomic child mortality differentials advanced here has been the premise that socioeconomic differentials in accident mortality are a major determinant of overall socioeconomic mortality differentials. Table 1 shows this directly for England and Wales, but evidence for the United States must be obtained indirectly. An implication of this argument is, as noted, that socioeconomic mortality differentials will vary in strength among subgroups of the child population in accordance with the importance of accident mortality in the subgroups. From vital statistics,[20–23] the proportions of deaths resulting from accidents, poisonings, and violence were calculated for each age-race-sex (years since birth) group for whom mortality differentials are reported in Table 2. The relationship between group-specific socioeconomic mortality differentials, as indexed by lnα in Table 2, and the percentage of deaths resulting from accidents is shown in Figure 1. The relationship between the percentage of deaths from accidents (p) and lnα for the association between maternal schooling and child mortality is strongly positive. The correlation weighted for the differential variances among the lnα is .65. The esimated linear relationship is weakened by the estimated differentials for Blacks which make up most of the serious outliers in Figure 1. On the White observations alone, the weighted correlation between p and lnα is .74. The extreme values for Blacks are best regarded as resulting from sampling variability in the lnα. Figure 1 shows the progressively greater importance of accident mortality from early childhood to the late teens, the greater relative importance of accidents for boys than for girls, and the corresponding higher socioeconomic differentials for teenagers and boys relative to young children and girls. These results suggest that the effect of accident mortality on socioeconomic mortality differences observed directly for England and Wales also obtains for the United States.

Discussion

This report has demonstrated that there are significant socioeconomic mortality differentials among persons under age 20 in the United States; that despite the low child mortality levels relative to those of adults and infants, socioeconomic differentials are substantial and indeed reach a peak in the later teenage years; and that a primary source of socioeconomic variation in mortality is the large differential risk to accident mortality among socioeconomic groups. If the role of accident mortality in generating socioeconomic mortality differentials is as strong as the results suggest, socioeconomic mortality differentials may be increasing over time as the accident proportion of overall child mortality increases.[24] This conjecture, however, remains to be demonstrated.

Although the empirical results are clear, they are based on the bare minimum of data from which mortality differences can be inferred. The CPS sample of child deaths is small, underrepresents children in large families, ignores

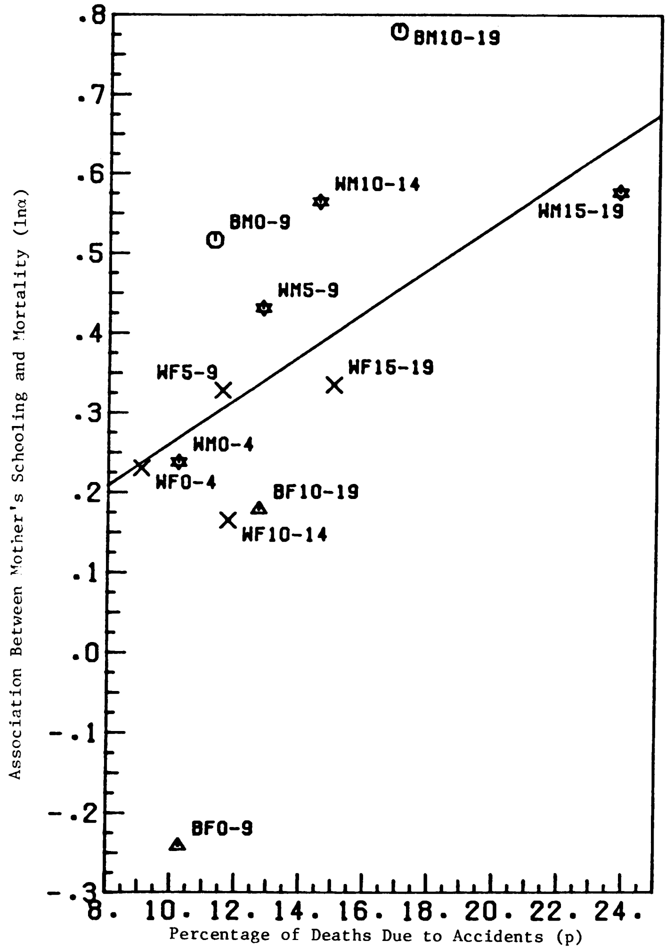

FIGURE 1—Relationship between Percentage of Deaths due to Accidents (p) and Association between Mother's Schooling (≥12 grades vs <12 grades) and Child Mortality for Selected Age-Race-Sex Groups (lnα). WM, WF, BM, BF denote White Males and Females and Black Males and Females respectively. (Lnα is taken from Table 2; p is calculated from published vital statistics.[20-23] Regression line was estimated by weighted least squares using weights recommended by Theil[24] to take account of differential reliability of lnα among groups.)

orphans, precludes calculation of age-specific death rates, relies upon the faulty memories of respondents who are asked only a single question about possible child mortality, and provides no retrospective information that might better measure children's environments than family characteristics at the survey date. Simply to secure reliable estimates of differential mortality, therefore, the results of the present analysis should be replicated using other methods and data sources.[25]

Taking the results of this analysis at face value, they indicate that accident prevention—recently singled out as a major health goal for children and teenagers by the Surgeon General[26]—has the potential of not only drastically cutting early deaths, but also reducing inequality in life chances. But the results also suggest that differentials in environmental risks are linked to broader socioeconomic differences in the population. Amelioration of socioeconomic inequalities, therefore, may be a necessary condition for significant child mortality reduction.

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