The impact of income, education, and family structure distributions on Black-White disparities in child health

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Introduction:

The Healthy People 2010 national health objectives call for the elimination of racial and ethnic disparities in health, but provide little specific guidance on how to achieve this goal. Black children fare worse than White children on many, if not most, indicators of health status and health care access and utilization. While it is widely acknowledged that the lower family incomes, lower parental education and fewer two-parent households of black children contribute to their poorer health profiles, there have been few attempts to assess the relative contributions of these social factors on Black-White child health disparities. This paper addresses the question of how much of the Black/White difference in various indicators of child health and access to health services would be eliminated by Black children having the same family income, parental education or family structure distribution of White children. We hypothesize that differences in income distributions are likely to have a greater effect than differences in parental education or family structure on indicators of access to health services, but that the relative effects of these three variables on indicators of health status are less predictable.

Data:

We use data for children less than 18 years of age collected by the National Health Interview Surveys (NHIS) of 1998 through 2002. The NHIS is a nationally representative sample of the civilian, noninstitutionalized population conducted annually by the National Center for Health Statistics. Data are collected through face-to-face interviews with adult household members present during the interview. Questions on respondent assessed health status, health-related activity limitation, health insurance coverage, and not getting needed medical care due to cost are asked for each person in the household and compiled into the NHIS "person file". In addition, a sample child is randomly selected from each family and additional questions for this child are asked of an adult respondent familiar with the child's health. These questions include whether or not the child: had an asthma attack in the past year, has vision problems, has a learning disability, had two or more trips to the emergency room in the past year, had no usual place for medical care, had no doctor visit in the past year, had no dental visit in the past year, and did not get dental care due to cost. Information for the randomly selected child from each household is contained in the NHIS "sample child" file.

Child's race is determined by response to a question on the primary race of the child and whether or not the child is of Hispanic origin. The race categories of White and Black, used in this study, exclude children of Hispanic origin. Level of parental education is determined by the highest grade in school completed by the parents or parent living with

the child. If no biological parent resides in the household with the child, the value of parental education refers to the highest grade completed by the person with the highest level of education in the household. Responses are grouped into 4 levels of education: less than high school, high school graduate or GED, some college, and college graduate. Family structure is determined through a series of questions on who resides in the household and is coded as both parents, single mother, and other. "Two parents" and "single mother" can include adoptive, step, in-law or foster parent(s) in addition to biological parents.

Family income refers to the total family income received in the previous calendar year by all members of the child's family residing in the household. Income is converted into a percent of the official poverty threshold by taking into account both the total family income and family size. Responses are grouped into four levels of income as a percent of poverty: <100%, 100-199%, 200-399%, 400%+. Whereas the amount of missing information for both parental education and family structure is small, family income was not initially reported for 21-25% of children in the study population. The NHIS makes use of other information available on respondents to impute family income using a multiple-imputation methodology. This methodology permits incorporation of the additional variability introduced by the imputation into analyses using family income.

For the years 1998 through 2002 combined, data for 138,651 children less than 18 years of age were collected in the family interview portion of the NHIS, and for 66,034 children in the sample child portion. After excluding children of Hispanic origin, those whose primary race was other than White or Black and those with missing values for family structure, parental education, family income (for whom information was insufficient for imputation), and/or any of the health indicator variables, there were 80,462 children remaining for analysis in the person file, and 42,790 children in the sample file.

Methods:

All analyses incorporated sample weights to generate estimates representative of non-institutionalized children in the U.S. and SUDAAN statistical software was used to account for the complex survey design in variance estimation. Differences between Black and White children in family income, parental education, family structure and health indicators were estimated and tested for significance using chi square statistics. In order to answer the question: "What would the rate of a given health indicator be for Black children, if they had the family income distribution, parental education, or family structure distribution of White children?" we computed rates for Black children standardized by the direct method to the family income distribution, parental education distribution, and family status distribution of White children. We also standardized rates for Black children to the joint distributions for White children combining family income and parental education, family income and family structure, and family income, parental education and family structure to assess the joint impact of differences in these distributions on Black/White differences in health indicators. In order to compare the impact of adjustment across health indicators, crude and standardized rates were converted into Black/White ratios and their associated confidence intervals are calculated. The appropriateness of direct standardization is discussed by comparing these results with odds ratios estimated through logistic regression modeling. We also assess the sensitivity of our results to the imputation of income by comparing the results with those obtained by excluding all children with missing values for family income.

Summary of preliminary results:

The percent distribution of Black children across levels of family income, parental education and type of family structure differed significantly from White children. For each of the twelve indicators of child health, Black children fared worse than White children, and all differences were statistically significant (p<.05) . Rate ratios for Black children relative to White children ranged from 1.11 for any health-related activity limitation to 3.10 for proxy reports of fair or poor health (see table below).

Standardizing the rates for Black children to the family income distribution of White children had the largest impact on the Black-White disparity for all health indicators except asthma attack in the past year and any health-related activity limitation. Family income standardization reduced the rate ratio of Black children relative to White children for the twelve health indicators by 8 to 39 percent. If Black children had the family income distribution of White children, the percent with no health insurance and no doctor visit in the past year would not have been significantly higher than the corresponding percents for White children and the percent with health-related activity limitation, learning disability, and not getting medical care or dental care due to cost would have been significantly lower than the corresponding percents for White children.

Standardizing the family structure distribution of Black children to that of White children reduced the Black-White rate ratios by 5 to 22 percent, and produced the largest reduction in the Black-White differential in the percent with an asthma attack in the past year. Family structure standardization also produced a slightly greater reduction in the Black-White differential in health-related activity limitation than did family income standardization. Standardizing the parental education distribution produced the widest range of reductions in the Black/White health indicator ratios, from 1 to 24 percent.

Standardizing to the combined family income and family structure distribution for White children had a larger impact on the Black-White differential for most of the health indicators than did standardizing to the joint family income and parental education distribution (data not shown). However, even standardizing to the joint distribution of all three social variables produced relatively small additional reductions in the Black/White differentials over what was achieved by family income standardization alone (see table below).

Effect of adjustment for family income, parental education, and family structure on rate ratios for health indicators,

Black children relative to White children: NHIS 1998-2002

	Unadjusted		Family Income		Parental Education		Family Structure		Family income, parental education & family structure	
	Rate Ratio	95% CI	Rate Ratio	95% CI	Rate Ratio	95% CI	Rate Ratio	95% CI	Rate Ratio	95% CI
In fair or poor health	**3.10**	(2.70-3.50)	**1.90**	(1.62-2.17)	**2.34**	(2.02-2.67)	**2.42**	(2.04-2.80)	**1.78**	(1.50-2.06)
No usual place for medical care	**1.68**	(1.46-1.89)	**1.28**	(1.09-1.46)	**1.47**	(1.27-1.68)	**1.45**	(1.23-1.67)	**1.20**	(1.02-1.39)
Two or more visits to the ER in the past year	**1.65**	(1.49-1.81)	**1.29**	(1.15-1.44)	**1.47**	(1.31-1.62)	**1.39**	(1.22-1.56)	**1.20**	(1.05-1.36)
Vision problems	**1.50**	(1.27-1.73)	**1.24**	(1.00-1.47)	**1.36**	(1.13-1.58)	**1.36**	(1.08-1.64)	**1.17**	(0.93-1.41)
No health insurance	**1.49**	(1.37-1.62)	**1.06**	(0.96-1.16)	**1.28**	(1.15-1.40)	**1.32**	(1.19-1.45)	**1.01**	(0.91-1.11)
No dental visit in the past year (ages 2+)	**1.40**	(1.33-1.47)	**1.24**	(1.17-1.31)	**1.26**	(1.19-1.34)	**1.34**	(1.26-1.42)	**1.21**	(1.13-1.29)
Asthma attack in past year	**1.39**	(1.25-1.52)	**1.28**	(1.13-1.43)	**1.35**	(1.21-1.49)	**1.22**	(1.07-1.36)	**1.19**	(1.04-1.34)
No doctor visit in the past year (age <7)	**1.30**	(1.04-1.55)	**1.03**	(0.84-1.23)	**1.12**	(0.88-1.36)	**1.13**	(0.91-1.36)	**1.04**	(0.82-1.27)
Didn't get dental care due to cost (ages 2+)	**1.17**	(1.01-1.33)	**0.84**	(0.72-0.95)	**1.07**	(0.92-1.22)	**1.02**	(0.85-1.19)	**0.80**	(0.68-0.93)
Didn't get medical care due to cost	**1.15**	(1.01-1.28)	**0.85**	(0.72-0.95)	**1.14**	(0.98-1.29)	**0.96**	(0.82-1.11)	**0.80**	(0.67-0.93)
Learning disability (ages 3+)	**1.15**	(1.03-1.27)	**0.88**	(0.77-0.98)	**0.96**	(0.85-1.07)	**0.98**	(0.86-1.11)	**0.83**	(0.71-0.94)
Any activity limitation	**1.11**	(1.03-1.18)	**0.91**	(0.83-0.98)	**0.98**	(0.90-1.06)	**0.90**	(0.82-0.98)	**0.81**	(0.73-0.89)