

## HEALTH STATUS BY SOCIAL CLASS AND/OR MINORITY STATUS: IMPLICATIONS FOR ENVIRONMENTAL EQUITY RESEARCH

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*Much of the epidemiologic research in the United States has been based only on the categories of age, sex and race; thus, race has often been used in health statistics as a surrogate for social and economic disadvantage. Few multivariate analyses distinguish effects of components of social class (such as economic level) from the relative, joint, and independent effects of sociocultural identifiers such as race or ethnicity.*

*This paper reviews studies of social class and minority status differentials in health, with a particular emphasis on health status outcomes which are known or suspected to be related to environmental quality and conditions which increase susceptibility to environmental pollutants. Sociodemographic data are presented for the U.S. population, including blacks, Asian American/Pacific Islanders, American Indian/Alaska Natives, and Hispanics. Four areas of health status data are addressed: mortality, health of women of reproductive age, infant and child*

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3. Key Words: environmental equity, ethnicity, minority, poverty, race, social class, socioeconomic status.

4. Abbreviations: CDC, Centers for Disease Control and Prevention; COPD, chronic obstructive pulmonary diseases; EEO, equal employment opportunity; HHANES, Hispanic Health and Nutrition Examination Survey; HIV, human immunodeficiency virus; NCHS, National Center for Health Statistics; NHANES, National Health and Nutrition Examination Survey; NHEFS, NHANES I Epidemiologic Followup Study; NHIS, National Health Interview Survey; NIDDM, non-insulin dependent diabetes mellitus; SGA, small for gestational age; USGS, United States Geological Survey.

*health, and adult morbidity. Conceptual and methodological issues surrounding various measures of position in the system of social strata are discussed, including the multidimensionality of social class, in the context of the importance of these issues to public health research. Whenever possible, multivariate studies that consider the role of socioeconomic status in explaining racial/ethnic disparities are discussed.*

## INTRODUCTION

Sociologists have observed that societies categorize individuals by such characteristics as sex, age, race, class, national origin, marital status, and education. Organizing populations by these categories allows us to investigate inequities in the distribution of health effects throughout the social strata. However, the social construction of such categories results in many problems with the definition, measurement, interpretation and understanding of these characteristics in relation to health effects.

The strong relationship between health status and position in the social strata is well known, and has been thoroughly documented by numerous studies using many different definitions and measures of health and of position in the social strata. For example, ethnic and racial minorities, the less educated, and those with low income have higher mortality, higher rates of most chronic conditions, higher rates of disability, and their daily activity is more restricted (Kitagawa and Hauser, 1973; Newacheck et al., 1980; Office of the Assistant Secretary for Health, 1981; Starfield, 1982; Ries, 1985, 1990; Wadsworth, 1986; Wilkinson, 1986, 1989; Blaxter, 1987; Marmot et al., 1987; Newacheck and Starfield, 1988; Williams, 1990; Children's Defense Fund, 1991; National Center for Health Statistics, 1991a,b, 1992; Fingerhut and Makuc, 1992; Montgomery, 1992). Moreover, recent studies indicate that the health status gap is growing wider (Feldman et al., 1989; Montgomery, 1992; Pappas et al., 1993).

Much of the epidemiologic research in the United States has been based only on the categories of age, sex, and race. But it is important to move beyond race alone in order to understand the causes of racial disparities in health (Public Health Service, 1992). Race is not a clear-cut category; the concept includes cultural, biologic, and sociopolitical components. For reasons discussed in this paper, the use of race in health statistics as a surrogate for social and economic disadvantage has caused concern among many public health investigators and social scientists alike (Linder and Grove, 1943; Haan and Kaplan, 1985; Weissman, 1990; Starfield et al., 1991; Krieger, 1992; Montgomery, 1992; Osborne and Feit, 1992; Williams, 1992). On the other hand, race may significantly affect health status independent of educational level or income: for example, differences between races in incidence rates for cancer at certain sites (e.g., the cervix uteri and prostate gland) may be due to cultural or biologic components (Baquet et al., 1991).

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A substantial literature exists showing health differentials by either race or socioeconomic status. However, there are comparatively few multivariate analyses that separate the relative, joint, and independent effects of sociocultural identifiers (such as race or ethnicity) from the components of social class (such as economic level). Although almost all national surveys sponsored by Public Health Service agencies include expanded questions on income, health insurance, and related socioeconomic variables, analysis and presentation of results often do not include these data. This paper uses multivariate studies that discuss the role of socioeconomic status in explaining racial disparities whenever such studies have been available. In the absence of such studies, univariate data on health effects are reported.

In the first section of this paper we discuss conceptual and methodological issues surrounding various measures of social stratification, particularly those most commonly used in public health research. We use the term "social class" broadly to mean position in the system of social strata, which is the term's common use in the U.S. literature, and not the narrow occupation-based definition used in the British classification system. Thus, "social class" denotes categories of social stratification not limited to occupation.

A comprehensive review of studies of social class and minority status differentials in health is beyond the scope of this paper. Therefore, our review is limited to selected health status outcomes known or suspected to be related to environmental quality and conditions and developmental processes that increase susceptibility to environmental pollutants. The following general areas are addressed: (1) mortality, (2) health of women of reproductive age, including behavioral risks, (3) infant and child health, and (4) adult morbidity.

In addition to addressing health outcomes and risk factors by minority status and social class indicators, this paper describes work in progress that has come to our attention, and identifies the most obvious information gaps. Almost all of the data cited in this paper are available through published National Center for Health Statistics (NCHS) reports, professional journals, or NCHS computer tapes available to the public.

### MEASURING POSITION IN THE SOCIAL STRATA

Social stratification categories are socially constructed. Those categories which are related to health reflect cultural, racial, socioeconomic, and political inequalities. Although social scientists cannot agree on a *precise* definition of "social class," the pattern of inequality in the relationship between health and position in the system of social strata is well documented, using many different definitions of social class. If we are to understand fully *how* and *why* lower social class is related to poorer health outcomes, we must eventually address not only the theoretical models that underpin and describe the social distribution of illness, but also the arguments from which the specific definitions of social class derive.

Social class is multidimensional, and economic dimensions are inherently and critically tied to cultural and political ones. Social class variables are important to health research because they indicate a person's level of autonomy (control over one's life) and the constraints on a person's capacity to fulfill both material and nonmaterial human needs. Economic well-being is central to the concept of class, but social class cannot be adequately captured by a single indicator such as current income or educational attainment. Different socioeconomic indicators, such as education and current income, are not interchangeable; they capture different elements of position in the social strata system, and each may affect health status in different ways. Moreover, racism and ethnic discrimination are based on an assessment that accords specific racial or cultural groups an inferior position in the system of social strata; in other words, a lower social class.

Because mixed racial and ethnic groups are common, construing race and ethnic categories as mutually exclusive presents a significant problem, whether race is used as a marker for genetic variation or as a sociocultural marker for position in the system of social strata. Many scholars have stressed the need to address the assumption that racial and ethnic categories are mutually exclusive and the consequences of this assumption for health research (Cooper and David, 1986; Krieger, 1987; Weissman, 1990; Hahn, 1992; Osborne and Feit, 1992). (This paper does not address theories of genetic causes of racial differences in health; see Cooper and David, 1986.)

It is important to keep in mind that each subcategory of these social properties or demographic characteristics encompasses a whole host of experiential differences (Rosenberg, 1968) that can vary with each combination of subgroups. For example, "American Indian" is a subcategory of race/ethnicity which by itself denotes a specific social context. A family of four with an income under \$14,000 identifies another specific social context. But an American Indian family of four, headed by a single female with an income under \$14,000, who lives in Arizona in substandard housing with no plumbing and contaminated well water, experiences a different social context from that of a two-parent family of four with an income under \$14,000 who lives in crowded tenement housing in a Chicago urban slum.

The association between social class and health is complex and not fully understood. Health, like social class, is an elusive concept. It is also, like social class, a multidimensional concept that must take into account not only physical environment and genetic components, but social environments and social structures as well. It would seem obvious that nutritious food, safe water, decent housing, education, secure employment, and adequate family income provide the necessary, basic social context for health. The economic, political, and cultural avenues through which social class influences health are evident in the social inequalities they produce. Deprivation and disadvantage in the standard of living place vulnerable populations at risk for poor health.

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Multivariate methods are an important tool in assessing the multidimensionality of social class associations. Whereas one indicator may show little or no relationship to health, careful multivariate analysis using several indicators will better capture the multidimensionality of social deprivation and disadvantage. Most importantly, the use of a single indicator will underestimate the strength of the relationship between health and social class. Given the empirical evidence that single indicators such as race, education, income, and occupation measure different aspects of social class and are not interchangeable, the use of multiple indicators of social class is encouraged.

Where possible, this paper reports the results of multivariate studies which attempt to differentiate the effects of race and socioeconomic status on health outcomes and risk factors. Indicators of social class in health surveys and in medical and vital statistics records are not uniformly available. Examples are given in the discussion of individual indicators.

Education, income, and occupation are the most commonly used measures of social class. Each indicator captures different contextual elements of a person's position in the social strata (Gold and Franks, 1990). Some investigators have used composite indexes (a weighted sum of the variables). For example, in a mental health study in the 1950s, Hollingshead and Redlich (1958) created an index of socioeconomic status that gave greater weight to educational level. The development of sophisticated methods in recent years makes composite indexes unnecessary. Moreover, the use of multivariate methods to assess the multidimensionality of social class associations is preferable to the use of composite indexes because of the serious problems they entail. One problem with composite indexes is that they obscure the relationship between component indicators and particular health outcomes (Liberatos et al., 1988). Education has been found to be inversely associated with the risk of myocardial infarction, but positively associated with angina pectoris. Thus, a National Heart, Lung, and Blood-Institute working group examining effects of socioeconomic factors on cardiovascular disease recommended that composite indexes not be used because they may obscure important differences in associations with the component indicators (Ostfeld and Eaker, 1985). We, also, do not recommend the use of composite indexes of social class.

Gender differences are an essential consideration in examining social class structures because gender and class reflect mutually reinforcing social processes (Andes, 1992). There are gender differences in social organization, and the social characteristics of women, including their child-bearing and greater child-care responsibilities, for example, are not taken into account with the usual social class measures. The impact of gender differences on occupation measures is discussed further in the Occupation section.

A woman's social class as measured by income is more subject to change over time (Grella, 1990). Data from the Panel Study of Income Dynamics show that the percent of women and children who lived in families classified as poor doubled in the year following a divorce or separation. Furthermore, the majority of divorced mothers do not receive child support, and the

incidence and the amount of child support declines as time passes following the divorce (Palmer, 1988). The increasing shift of economic responsibility to mothers for the maintenance of households has contributed greatly to increased childhood poverty for more than two decades (Bianchi and Spain, 1986; Palmer, 1988; McLanahan et al., 1989; Eggebeen and Lichter, 1991).

Childhood environment may be even more important than adult environment for predicting health effects in adults (Dutton, 1981; Wadsworth, 1986; Marmot et al., 1987; Kaplan and Salonen, 1990; Starfield et al., 1991). There is mounting evidence that a woman's childhood health, early nutrition, and environment affect the outcomes of her pregnancies (Valanis and Rush, 1979; Valanis et al., 1979; Emanuel et al., 1989; Hu, 1991).

Yet, very little epidemiologic research has been conducted on the effects of childhood social class on adult health outcomes. Not surprisingly, the relative strengths and weaknesses of childhood and adult social class measures have also not been addressed.

The possibility that childhood poverty may affect both social class and health outcomes in adulthood has enormous implications for the relationship between health and social class, as well as for environmental health equity. Nutritional deficiencies in children and pregnant women associated with poverty and their relation to environmental pollutant susceptibility are discussed in the Health Outcomes section of this paper. Consider also the psychoneurological damage associated with relatively "low" levels of lead exposure in children. Measures of adult social class ignore health effects in adulthood that are more appropriately linked to childhood social class. If an adult living "above poverty" has an illness that is the long-term sequelae of illness initiated while living in poverty as a child, the illness may be incorrectly associated with "above poverty" income instead of poverty. Given the profound effects of childhood poverty both on one's health and life chances, the issue of measuring childhood social class needs to be addressed in both epidemiologic and social science research.

#### *Income*

The measure of family income only indirectly approximates those things which depend on sufficient income, such as appropriate nutrition, adequate housing, car ownership, education, and preventive and primary medical care. Current family income (or the official poverty index) is almost exclusively the only measure of financial resources used in analyzing health data, even though other variables may exist in some surveys. Recently, indicators have been used which go beyond the current income measure and tap into long-term economic well-being, i.e., financial assets or wealth. Car ownership and house ownership, two examples of these financial asset indicators, have shown inverse relationships to mortality (Goldblatt, 1990). Neighborhood characteristics (including urban or rural region), family structure, and child care expenses are other variables that could be used to more clearly specify economic well-being.

The official poverty line with considerable literature is even true poverty (O'Hare, 1985) but space does not allow a problems with the poverty reference as it was developed. poverty signified the inability budget and spending pattern and Volgy, 1992). Molly account of new 1978 data official index (Orshansky, used, the income needed (Schwarz and Volgy, 1992).

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#### *Education*

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The official poverty line was \$13,359 for a family of four in 1990. It should be noted that a considerable literature is evolving on the adequacy of the official poverty index as a measure of true poverty (O'Hare, 1985; O'Hare et al., 1990; Wilson, 1990; Schwarz and Volgy, 1992), but space does not allow a comprehensive evaluation of this issue. One of the most serious problems with the poverty index is that it has not retained its original definition and frame of reference as it was developed by Mollie Orshansky in the mid 1960s. As originally defined, poverty signified the inability of families to afford the basic necessities of living, based on the budget and spending patterns of those Americans with an average standard of living (Schwarz and Volgy, 1992). Molly Orshansky herself estimated that a poverty index revised to take account of new 1978 data would produce a poverty population about 38% higher than the official index (Orshansky, 1978). In 1990, if the original approach to measuring poverty were used, the income needed for a family of four would have been 67% higher, or \$22,300 (Schwarz and Volgy, 1992).

It is important to remember that the relative cost of living is higher for low-income families than it is for more affluent households (Beeghly, 1984; Wiecha and Palombo, 1989; O'Hare et al., 1990; Wilson, 1990). In other words, in poor households the proportion of income spent on housing, food and other necessities is greater than for higher income households. Another serious problem with the poverty index is that it includes no adjustment for regional differences in the cost of living, even though there are enormous differences in what a particular annual income will buy in different areas of the country. Although there are major problems with the official poverty index, it does take into account household size, and it makes some adjustment in the cost of living across years, based on the consumer price index.

#### *Education*

Vital statistics and medical care records do not consistently include data on social class. Before 1989, the level of education was not an item on the standard death certificate recommended for use by all the states (although it was on death and birth certificates in *some* states). The latest revision of the standard death certificate in 1989 includes an item on educational attainment—the first time that an item on socioeconomic status of decedents other than occupation has appeared on the standard certificate. Nevertheless, information on educational level is still missing on large numbers of death certificates simply because it has not been entered. NCHS medical records surveys, such as the National Hospital Discharge Survey, do not contain measures of social class because the data are not consistently recorded by participating institutions.

Educational level is the most commonly used measure of socioeconomic status in epidemiologic studies (Liberatos et al., 1988). Using educational level as a proxy for financial well-being is understandable if income or other economic variables are unknown, and if there are sound conceptual reasons for using education. However, educational level is a crude measure of social class and cannot be equated with measures of financial resources.

There are six major problems with using education as the sole indicator of social class. First, increased educational attainment does not necessarily mean higher income and/or higher occupational achievement, because socioeconomic returns to education vary over time. The socioeconomic status achieved by a high-school education in earlier decades now requires a college education. Whereas a high-school education in the 1940s and 1950s led to highly paid manufacturing jobs, since the late 1970s high-school educated men have been in low demand, and their incomes and occupations have suffered accordingly (Levy and Murnane, 1992). Although median educational level has increased, the median income of full-year, full-time male workers is lower today than it was in 1973 (Bane and Ellwood, 1989).

Second, educational level varies by age group—that is, educational attainment has increased dramatically over time. Third, economic returns for education differ by gender and race; women and minorities generally receive less economic return for the same education than white males, although black and Asian American women benefit more from a college education than white women (Farley and Allen, 1987; Bureau of the Census, 1992a,b; Levy and Murnane, 1992). Fourth, formal education level varies by region; this factor may introduce variability into the relationship of education to income and occupation.

Fifth, years of schooling, the usual measure of education, is probably not the best measure. There is some evidence that years of schooling are less influential in determining occupational status than certification or credentials, and vocational or other adult training is not counted in standard grades completed. Further, multiple aspects of education affect subsequent income and occupation, such as type of certification or degree (Liberatos et al., 1988). Finally, income and occupation are also affected by work experience, a factor not included when measuring years of formal education.

In addition to its association with occupation and income, education is assumed to have health effects through its association with lifestyle, health behaviors, and values. A basic premise of sociology is that social structures shape individual values and behavior. David Williams observes that socioeconomic differentials in health status are due, at least in part, to conditions of life that derive from an individual's structural position in society. Thus, lifestyle characteristics and living conditions are to be viewed not simply as individual characteristics but "as the patterned response of social groups to the realities and constraints of the external environment" (Williams, 1990, pp. 81-82).

#### *Occupation*

Until recently, occupation has been the only social class information available from death certificates. Although occupation has been used as a socioeconomic indicator for mortality analyses, conclusions have been limited by the quality and coverage of the information collected.

Selecting the most appropriate social order is a problem (Parker et al., 1992; Parker et al., 1992). Prestige divisions. Comparison of prestige scores, were therefore probably not (Andes, 1992). These comparisons and minorities are con-

The occupation indicator is an economic independent appropriate measure of contexts her individual occupation, if she is occupation may offer (Stanworth, 1984; Dal-

There is also the question of hazards, or both. Still indicator; current occupation longest job held.

*Race, Ethnic Origin.* During 1990, 12% of Indian/Eskimo/Aleut (Bureau of the Census origin (22,354,059). tended to be young American Indians, 28 18, while 23.8% of Population Division, and sex for the United

#### *Education*

Blacks, American Indian school (Table 2). About had graduated from 77.5% of Asian American (92).



Selecting the most appropriate method for creating a hierarchy of occupations as they relate to the social order is a problem in all occupation-based measures (Liberatos et al., 1988; Andes, 1992; Parker et al., 1992). Differences in occupations cut across gender, class, race, and prestige divisions. Conventional measures of occupation, such as occupational rankings and prestige scores, were based on the job content and status of employed white men, and are therefore probably not appropriate for white women or minorities (Krieger, 1991, 1992; Andes, 1992). These conventional measures, for example, fail to address the fact that women and minorities are concentrated in lower-paying and lower-status jobs.

The occupation indicator is more problematic for women because the presence or absence of economic independence is obscured (Gamarnikow et al., 1983). In some circumstances, the appropriate measure of a woman's social class may be that of her household, while in other contexts her individual social class may be more appropriate. Therefore, her husband's occupation, if she is married, may be a better measure in one circumstance, while her own occupation may offer a more accurate measure in another (Haug, 1973; Goldethorpe, 1983; Stanworth, 1984; Dahl, 1991; Krieger, 1991).

There is also the question of whether the occupation measure indicates prestige, exposure to hazards, or both. Still another issue is which job among a lifetime of jobs is the appropriate indicator; current occupation or last job might both convey different information than does the longest job held.

## POPULATION DEMOGRAPHICS

### *Race, Ethnic Origin, and Age*

During 1990, 12% of the total U.S. population was black (29,986,060), 1% was American Indian/Eskimo/Aleut (1,959,234), and 3% was Asian/Pacific Islander (7,273,662) (see Table 1) (Bureau of the Census, 1991c). Nine percent of the total U.S. population was of Hispanic origin (22,354,059). (Hispanics may be of any race.) In general, these racial/ethnic groups tended to be younger than all whites (see Figure 1). In 1990, 32% of blacks, 35.6% of American Indians, 28.6% of Asian-Americans, and 34.7% of Hispanics were under the age of 18, while 23.8% of whites were under 18 (unpublished tables: Racial Statistics Branch, Population Division, Bureau of the Census. "1990 Census: Race and Hispanic origin by age and sex for the United States, regions and states").

### *Education*

Blacks, American Indians, and Hispanics are less likely than whites to have completed high school (Table 2). According to the 1990 Census, 49.8% of Hispanics at least 25 years of age had graduated from high school compared to 63.1% of blacks, 65.5% of American Indians, 77.5% of Asian Americans and 77.9% of whites (Bureau of the Census, 1992, Table CPH-L-92).

**TABLE 1. United States Population, by Race and Hispanic Origin: 1990**

Race and Hispanic Origin	Number	Percent	Percent Change Since 1980
White	199,686,070	80.3%	6.0%
Black	29,986,060	12.1	13.2
American Indian/Eskimo/Aleut	1,959,234	0.8	37.9
American Indian	1,878,285	0.8	37.7
Eskimo	57,152	0.0	35.6
Aleut	23,797	0.0	67.5
Asian or Pacific Islander	7,273,662	2.9	107.8
Chinese	1,645,472	0.7	104.1
Filipino	1,406,770	0.6	81.6
Japanese	847,562	0.3	20.9
Asian Indian	815,447	0.3	125.6
Korean	795,849	0.3	125.3
Vietnamese	614,547	0.2	134.8
Hawaiian	211,014	0.1	26.6
Samoan	62,964	0.0	50.1
Guamanian	49,345	0.0	53.4
Cambodian	147,411	0.0	818.8
Hmong	90,082	0.0	1631.0
Laotian	149,014	0.0	212.5
Thai	91,275	0.0	101.6
Bangladeshi	11,838	0.0	800.9
Burmese	6,177	0.0	124.1
Indonesian	29,252	0.0	204.1
Malayan	12,243	0.0	200.4
Okinawan	2,247	0.0	58.8
Pakistani	81,371	0.0	415.3
Sri Lankan	10,970	0.0	275.3
All other Asian	148,111	0.0	905.7
Tongan	17,606	0.0	182.8
Tahitian	944	0.0	19.3
Northern Mariana Islander	960	0.0	37.5
Palauan	1,439	0.0	107.9
Fijian	7,036	0.0	148.3
All other Pacific Islander	13,716	0.0	138.0
Hispanic Origin	22,354,059	9.0	53.0
Mexican	13,495,938	5.4	54.4
Puerto Rican	2,727,754	1.1	35.4
Cuban	1,043,932	0.4	30.0
Other Hispanic	5,086,435	2.0	66.7
Not of Hispanic Origin	226,355,814	91.0	6.8

Source: Bureau of the Census, United States Department of Commerce News, CB91-215, June 12, 1991.

### Occupation

Blacks and Hispanics are employed in occupations that pay relatively lower wages (Table 3). For example, in 1991, 13% of Hispanics and 16.3% of blacks worked in managerial or professional specialty occupations compared to 27.7% of whites (unpublished tables: Bureau of Labor Statistics, Department of Labor. "1991 Annual Averages from the Current Population

5-17 years

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Change Since 1980

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50.1  
53.4  
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1631.0  
212.5  
101.6  
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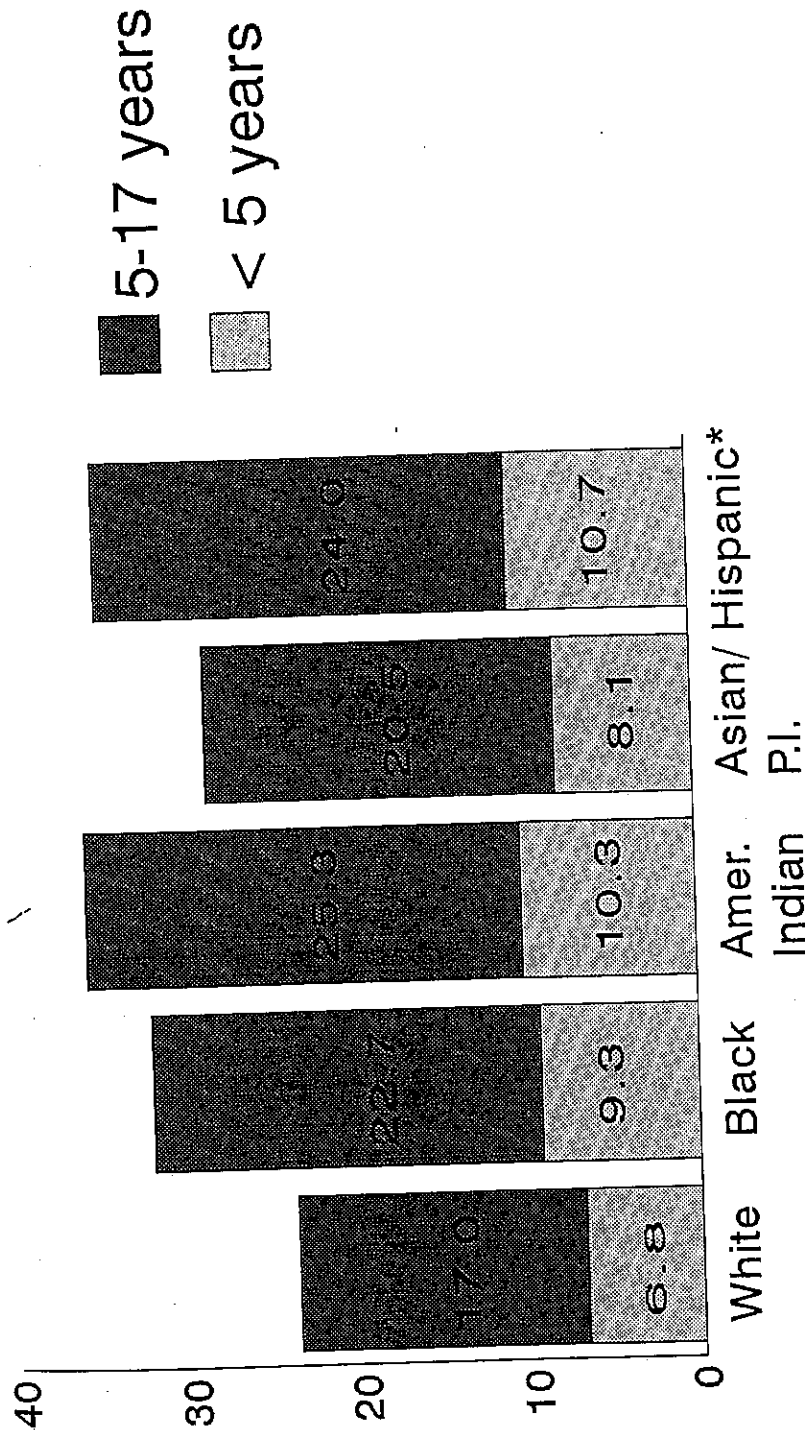


FIGURE 1. Proportion of population under 18 years of age by race/ethnic origin, 1990. Source: 1990 Census, Bureau of the Census. \* Hispanics can be of any race.

**TABLE 2.** Percent of Adults at Least 25 Years of Age Who Have Received a High School or Bachelor's Degree by Race/Ethnic Origin

Educational Attainment	White	Black	American Indian/ Alaska Native	Asian/Pacific Islander	Hispanic*
High school degree	77.9%	63.1%	65.5%	77.5%	49.8%
Bachelor's degree	21.5	11.4	9.3	36.6	9.2

Source: Bureau of the Census, 1990 Census, Table CPH-L-92.

\*Hispanics can be of any race.

**TABLE 3.** Employed Persons by Race/Ethnic Origin and Occupation: 1991 Annual Averages

Occupation	White	Black	Hispanic
Managerial and professional specialty occupations	27.7%	16.3%	13.0%
Technical, sales, and administrative support	31.2%	28.3%	24.5%
Service occupations	12.4%	23.3%	20.3%
Precision production, craft, and repair	11.7%	8.6%	12.9%
Operators, fabricators, and laborers	13.9%	21.7%	23.4%
Farming, forestry, and fishing	3.1%	1.9%	5.7%

Source: Unpublished tables from the Current Population Survey, U.S. Department of Labor, Bureau of Labor Statistics.

Survey"). Census data for 1990 are available, but not in any easily accessible form; the Equal Employment Opportunity (EEO) file contains breakdowns for approximately 500 occupational categories by race/ethnic origin.

Asian Americans born in the United States work in much the same occupations as white Americans (Gardner et al., 1985). Foreign-born Asian Americans are found disproportionately in low-paying service occupations, but they are also concentrated in professional, managerial, and executive positions. Because of language problems, differing professional standards from those in their home country, and discrimination, newly arrived Asian or other immigrants often must first take jobs for which they are overqualified.

#### *Income*

As reported by the 1990 Census, median household incomes varied widely by minority status. The median household income for whites was \$31,435, compared to \$19,758 for blacks, \$20,025 for American Indians, \$36,784 for Asian Americans, and \$24,156 for Hispanics (unpublished tables: Bureau of the Census, 1990 CPH-L-94).

#### *Poverty*

The childhood poverty rate in 5 children, live in household with income below \$10,000 (Lichter, 1991; unpublished tables). The poverty index was \$1 increasing poverty among teen-aged minority. Of off almost 30% lived in rural central cities.

The sharp rise in the poverty rate among declining family income a in 1973 (Bane and Ellwood, 1986) increased proportion of children living in families headed by divorced or separated parents (Lichter, 1991). The poverty rate was 50%. Since the vast majority of poverty among single-parent families are low-paying jobs with children (Bianchi and Spain, 1986; unpublished tables: Bureau of the Census, 1990 CPH-L-94).

Poverty rates vary dramatically by race/ethnic origin in poverty in 1992, compared to 1991, children, and 16.9% of white children in 1993 Current Population Survey. The 1993 Current Population Survey suggests that 38.5% of black children (unpublished tables: Bureau of the Census, 1990 CPH-L-94).

**TABLE 4.** Poverty Rates by Age and Race

Age	White	Black
< 18	16.9%	46.5%
18-64	9.6	25.5
≥ 65	10.9	33.5

Source: Current Population Survey, 1991.

These rates do not show the effect of race/ethnic origin. For example, 52.2% of black children in 1991, compared to 39.5% of white children in 1991.

*Poverty*

The childhood poverty rate is higher than at any time since 1960; about 21.9%, or more than 1 in 5 children, live in households whose income is at or below poverty level (Eggebeen and Lichter, 1991; unpublished tables: Bureau of the Census, 1992 Current Population Survey). (The poverty index was \$13,924 for a family of four in 1991). Contrary to popular perception, increasing poverty among children is not limited to urban ghettos or the deviant behavior of a teen-aged minority. Of officially poor children in 1987, about 44% were nonHispanic whites; almost 30% lived in rural areas, while fewer than 9% lived in areas of high poverty in large central cities.

The sharp rise in the poverty rate for children in the last two decades is primarily the result of declining family income and rising unemployment. Median family income is lower now than in 1973 (Bane and Ellwood, 1989; Bureau of the Census, 1991a). However, part of the increased proportion of children living in poverty is due to the increased proportion of children living in families headed by women, the large majority of whom (about two-thirds) are divorced or separated (Palmer, 1988; McLanahan, 1989; Teachman, 1990; Eggebeen and Lichter, 1991). The poverty rate for children living in families headed by women is about 50%. Since the vast majority of custodial parents are women, the problem of childhood poverty among single-parent families is largely a problem of single mothers concentrated in low-paying jobs with child-rearing responsibilities and having inadequate financial resources (Bianchi and Spain, 1986; Palmer, 1988; McLanahan, 1989).

Poverty rates vary dramatically by race and ethnic origin: 46.6% of black children were living in poverty in 1992, compared to 39.9% of Hispanic children, 16.3% of Asian American children, and 16.9% of white children (see Table 4) (unpublished tables: Bureau of the Census, 1993 Current Population Survey). Although the Current Population Survey cannot provide reliable estimates of the proportion of American Indian children living in poverty, the 1990 Census suggests that 38.3% of American Indian children were living in poverty during 1989 (unpublished tables: Bureau of the Census, 1990 Census, 1990 CPH-L-95).

TABLE 4. Poverty Rates by Race/Ethnic Origin and Age

Age	White	Black	Hispanic Total	Mexican- American	Puerto Rican	Asian/Pacific Islander	Total U.S.
< 18	16.9%	46.6%	39.9%	39.5%	52.2%	16.3%	21.9%
18-64	9.6	25.7	23.9	24.7	28.1	11.0	11.7
≥ 65	10.9	33.3	22.0	22.0	18.8	10.5	12.9

Source: Current Population Survey, March 1993.

These rates do not show the great disparities found within major racial/ethnic origin groups. For example, 52.2% of Puerto Rican children under the age of 18 were living in poverty in 1991, compared to 39.5% of Mexican Americans (Table 4). During 1979, the percentage of

Asian American families living in poverty ranged from 4.2% for Japanese to 67.2% for Laotians (Bureau of the Census, 1988).

### HEALTH OUTCOMES AND RELATED RISK FACTORS

#### *Mortality*

Mortality rates for blacks, American Indians, Hispanics and Asian Americans have not been equally available. The National Center for Health Statistics (NCHS) has published death rates for blacks for many years. The Indian Health Service, in collaboration with NCHS, publishes death rates for American Indians/Alaskan Natives for areas served by the Indian Health Service. The NCHS first published Hispanic death rates for the entire age span in 1990 (Maurer et al., 1990). Maurer et al.'s analysis was limited to specific Hispanic origin groups from the 15 reporting states in 1979-1981, because many states had not included an Hispanic identifier on death certificates and a large number of certificates were missing information on Hispanic origin (Maurer, 1990).

Age specific death rates for 1988 were published for selected causes for all Asian Americans combined in 1991 (National Center for Health Statistics, 1991a). Since mortality rates vary dramatically by specific Hispanic origin and by specific Asian American subgroup, only data by specific ethnic subgroups are presented in this paper. Although the quantity of mortality data for Hispanics and for Asian Americans in published tables has recently increased substantially, the information is still not as detailed as that for blacks.

These mortality data have not been examined by social class within each race or ethnic group; cautions about the inadequacy of measuring race alone are in order. Several studies have shown that race differentials for most causes of mortality become smaller or disappear when socioeconomic status is controlled for (American Cancer Society, 1986; Bassett and Krieger, 1986; Lerner, 1986; Keil et al., 1992; Rogers, 1992). Even though most states have incorporated an item about the decedent's educational level on their death certificates, this information is still missing on many death certificates. The quality of the data on educational level being collected on death certificates needs to be thoroughly evaluated. Analyses of 1990 national mortality data by race and educational level were not available in time to be included in this paper.

With the exception of suicide and chronic obstructive lung disease, blacks have higher mortality rates (age-adjusted) than whites for 13 of the 15 leading causes of death (Table 5). For example, blacks have a 47% higher age-adjusted death rate for heart diseases, 37% higher death rate for malignant neoplasms, 89% higher death rate for cerebrovascular diseases, 58% higher death rate for chronic liver disease and cirrhosis, and a risk of dying from nephritis, nephrotic syndrome, and nephrosis that is 278% that for whites (National Center for Health Statistics, 1993).

TABLE 5. Ratio of Deaths

Cause of Death
All causes
Diseases of the heart
Malignant neoplasms
Cerebrovascular disease
Chronic obstructive pulmonary disease
Accidents and adverse events
Motor vehicle accidents
All other accidents and adverse events
Pneumonia and influenza
Diabetes mellitus
Suicide
Human immunodeficiency virus infection
Homicide
Chronic liver disease and cirrhosis
Nephritis, nephrotic syndrome, and nephrosis
Septicemia
Atherosclerosis
Certain conditions of the digestive tract

Source: National Center for Health Statistics (1993).

American Indians and Alaska Natives have an elevated risk of death. The ratio of deaths for those between 15 and 64 years of age is 1.4 for those 65 years and older. Indians have a lower age-adjusted death rate for malignant neoplasms, and chronic liver disease and cirrhosis which is 50% lower.

Mexican Americans are at a higher risk of death from malignant neoplasms, chronic liver disease and cirrhosis, and chronic obstructive pulmonary disease than whites (Maurer et al., 1990). They are also more likely to die of chronic liver disease and cirrhosis.

For each major cause of death, the ratio of deaths for blacks to whites to die (Yu et al., 1990) does not distinguish between the mortality experience of the subgroups. Further analyses are needed to have much higher mortality rates thought to be the main

**TABLE 5. Ratio of Age-Adjusted Death Rates for the 15 Leading Causes of Death by Race: United States, 1991**

Cause of Death	Ratio of Black to White
All causes	1.60
Diseases of the heart	1.47
Malignant neoplasms	1.37
Cerebrovascular diseases	1.89
Chronic obstructive pulmonary diseases	0.83
Accidents and adverse effects	1.28
Motor vehicle accidents	0.98
All other accidents and adverse effects	1.69
Pneumonia and influenza	1.46
Diabetes mellitus	2.42
Suicide	0.57
Human immunodeficiency syndrome	3.42
Homicide	6.76
Chronic liver disease and cirrhosis	1.58
Nephritis, nephrotic syndrome and nephrosis	2.78
Septicemia	2.71
Atherosclerosis	1.12
Certain conditions originating in the perinatal	3.13

Source: National Center for Health Statistics, 1993a.

American Indians and Alaskan Natives in the areas served by the Indian Health Service also have an elevated risk of mortality due to kidney diseases when compared to whites: a ratio of 4.5 for those between the ages of 25 and 44, 3.9 for those between the ages of 45 and 64, and 1.4 for those 65 years and older (Indian Health Service, 1991) (Table 6). Although American Indians have a lower age-adjusted death rate than whites for diseases of the heart, malignant neoplasms, and chronic obstructive pulmonary disease, they have a higher risk of dying from chronic liver disease. American Indians have an age-adjusted death rate for chronic liver disease and cirrhosis which is 3.37 times that of whites.

Mexican Americans and Puerto Ricans have a lower risk of dying of diseases of the heart, malignant neoplasms, cerebrovascular diseases, and chronic obstructive pulmonary diseases than whites (Maurer et al., 1990) (Table 7). But Puerto Ricans are 1.80 times as likely to die of chronic liver disease and cirrhosis as whites, while Mexican Americans are 1.94 times as likely to die of chronic liver disease and cirrhosis.

For each major cause of death examined, Californian Asian Americans were less likely than whites to die (Yu et al., 1985) (Table 8). These ratios of age-adjusted death rates, however, do not distinguish between recent immigrants and native-born persons and do not describe the mortality experience of Asian Americans living outside California and other Asian American subgroups. Further analysis of the California mortality data suggests that recent immigrants have much higher mortality rates than do the native-born. Socioeconomic status gradients are thought to be the main explanatory factor.

**TABLE 6. Ratio of Age-Adjusted Death Rates for Selected Causes of Death by American Indian/Alaskan Natives: United States, 1986-1988\***

Cause of Death	Ratio of American Indians/ Alaskan Natives to Whites
All causes	1.18
Diseases of the heart	0.82
Malignant neoplasms	0.68
Cerebrovascular diseases	0.94
Accidents and adverse effects	2.91
Motor vehicle accidents	2.83
All other accidents and adverse effects	3.03
Chronic obstructive pulmonary diseases	0.63
Pneumonia and influenza	1.49
Diabetes mellitus	3.03
Suicide	1.42
Chronic liver disease and cirrhosis	3.37
Homicide and legal intervention	3.09
Nephritis, nephrotic syndrome and nephrosis	
25 - 44 years	4.50
45 - 64 years	3.85
≥ 65 years	1.42
Atherosclerosis	0.75

Source: Indian Health Service, 1992.

\*American Indian rates are for Indian Health Service service areas.

White rates are for total United States from 1987.

**TABLE 7. Ratio of Age-Adjusted Death Rates for Selected Causes of Death by Hispanic Origin: 1990\***

Cause of Death	Ratio of Mexican American to White	Ratio of Puerto Rican to White
Diseases of the heart	0.72	0.72
Malignant neoplasms	0.62	0.56
Cerebrovascular diseases	0.90	0.94
Accidents and adverse effects	1.08	0.85
Motor vehicle accidents	1.12	0.82
Chronic obstructive pulmonary diseases	0.37	0.59
Diabetes mellitus	1.59	1.34
Suicide	0.51	0.70
Chronic liver disease and cirrhosis	1.94	1.80
Homicide	2.78	2.33

Source: National Center for Health Statistics, unpublished tables, 1993.  
\*Excludes New York City.

\*Excludes New York, New Hampshire, Louisiana, Oklahoma, and Connecticut and covers 88% of the total Hispanic, 99% of the Mexican-American, and 54% of the Puerto Rican populations.

### Maternal and Infant Health

**Infant Mortality.** Infant mortality rates based on data from files linking infant death certificates with corresponding infant birth certificates are considered to be better estimates of infant

**TABLE 8. Ratio Death**

**Cause of Death**

All causes  
Heart disease  
Cancer  
Cerebrovascular disease  
Accidents  
Chronic obstructive pulmo  
Pneumonia and influenza  
Diabetes mellitus  
Chronic liver disease and  
Atherosclerosis  
Suicide and self-inflicted i

Source: Yu, 1985.

Source: Yu, 1985.

mortality among racial/ethnic groups, and the mother, which was reported by Hahn et al., 1991; Hahn et al., 1991. The results are consistent with those based only on infant mortality rates are

Infant mortality rates based on education are shown in Table 9 for the combined population. Infant mortality rates vary by education level, with whites to 18.2 deaths per 1,000 live births have the highest infant mortality rate (Table 9, row 10), infant mortality rates are lowest for the attainment groups (Kleiner et al., 2002). It is likely to die (12.1 deaths per 1,000 live births) than a high school education.

The National Survey of  
including survey years  
fetal mortality statisti  
than half of the fetal de  
parents.

*Low Birth Weight.* Blacks (less than 2500 grams) mothers with the high



**TABLE 8. Ratio of Age-Adjusted Death Rates for Selected Causes of Death by Race: 1980**

Cause of Death	Ratio of Chinese to White	Ratio of Japanese to White	Ratio of Filipino to White
All causes	0.63	0.52	0.45
Heart disease	0.54	0.42	0.42
Cancer	0.76	0.60	0.40
Cerebrovascular disease	0.76	0.76	0.66
Accidents	0.34	0.44	0.39
Chronic obstructive pulmonary disease	0.50	0.34	0.31
Pneumonia and influenza	0.81	0.73	0.59
Diabetes mellitus	0.81	0.64	0.49
Chronic liver disease and cirrhosis	0.42	0.34	0.29
Atherosclerosis	0.57	0.41	0.25
Suicide and self-inflicted injury	0.64	0.62	0.30

Source: Yu, 1985.

mortality among racial/ethnic groups, since information on the ethnic origin or race of the mother, which was recorded on the birth certificate, can be used (Kleinman, 1990; Becerra et al., 1991; Hahn et al., 1992). A comparison of infant mortality rates based on linked file data with those based only on death certificates has shown that, for certain racial/ethnic groups, infant mortality rates are significantly underestimated when only the death certificate is used.

Infant mortality rates based on the National Linked Files of Births and Infant Deaths are shown in Table 9 for the combined years 1985-1987 (National Center for Health Statistics, 1993c). Infant mortality rates vary greatly by race/ethnic origin—from 8.5 deaths per 1,000 live births for whites to 18.2 deaths per 1,000 for blacks. Blacks, American Indians, and Puerto Ricans have the highest infant mortality rates. In an analysis of the 1983-1984 linked file data (Table 10), infant mortality rates were found to be higher for blacks than whites within educational attainment groups (Kleinman et al., 1991). The infants of black college graduates were more likely to die (12.1 deaths per 1,000 live births) than were infants of white mothers having less than a high school education (11.6 per 1,000).

The National Survey of Family Growth collected data on fetal loss for all gestational periods, including survey years 1976, 1982, and 1988, but these data have not been tabulated. Although fetal mortality statistics have been published from the national vital statistics system, less than half of the fetal death certificates have information entered on the educational level of the parents.

**Low Birth Weight.** Blacks and Puerto Ricans also have the highest rates of low birth weight (less than 2500 grams) (Table 11) (National Center for Health Statistics, 1992). Babies of mothers with the highest education were the least likely to be of low birth weight (see Figure

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Ratio of Puerto Rican  
to White

0.72  
0.56  
0.94  
0.85  
0.82  
0.59  
1.34  
0.70  
1.80  
2.33

cut and covers 88% of the  
n populations.

infant death certificates  
etter estimates of infant

**TABLE 9.** Infant Mortality Rates by Race/Hispanic Origin of Mother: United States, 1985-1987 Birth Cohorts

Race/Ethnic Origin	Infant Deaths per 1,000 Live Births
White	8.5
Black	18.2
American Indian or Alaskan Native	13.3
Asian or Pacific Islander	7.6
Chinese	6.0
Japanese	6.6
Filipino	7.2
Other Asian or Pacific Islander	8.3
Hispanic Origin	8.5
Mexican American	8.1
Puerto Rican	10.9
Cuban	7.7
Central and South American	7.8
Other and unknown Hispanic	9.1
Non-Hispanic White	8.4
Non-Hispanic Black	17.9

Source: National Center for Health Statistics, 1993a.

**TABLE 10.** Infant Mortality Rates (Rate/1000 Live Births) by Mother's Educational Attainment for Mothers at Least 20 Years of Age: 1983 and 1984 Birth Cohorts

Educational Attainment	Black			White		
	Infant	Neonatal	Postneonatal	Infant	Neonatal	Postneonatal
< 12 years	20.1	10.9	9.1	11.6	6.4	5.2
12 years	16.1	10.7	5.4	7.8	5.1	2.6
13-15 years	14.2	10.1	4.1	6.7	4.5	2.2
≥ 16 years	12.1	9.2	2.9	5.7	4.0	1.7

Source: Kleinman, 1991.

2). Nevertheless, black mothers had two or more times the rate of babies with low birth weight than white mothers, even when both groups of mothers were within the same category of educational attainment (see Figure 2) (National Center for Health Statistics, in press). In fact, black college-educated mothers had higher rates of babies with low birth weight than the highest rates for white mothers of low birth weight babies. Again, education is just one aspect of social class and does not capture other dimensions of social stratification.

As noted earlier, there are problems with using only measures of adult social class and using the level of education attained (an adult social class measure) as the sole indicator of social class. A study by Starfield et al. (1991), using longitudinal data and three poverty measures, found that poor black and poor white mothers did not differ significantly in their risk of having

**TABLE 11.** Low Birth Weight Babies by Race/Ethnic Origin of Mother: United States, 1985-1987 Birth Cohorts

Race/Ethnic Origin	Low Birth Weight Babies per 1,000 Live Births
White	10.5
Black	21.2
American Indian/Alaskan Native	15.3
Asian/Pacific Islander	7.6
Chinese	6.0
Japanese	6.6
Hawaiian	7.2
Filipino	8.3
Other Asian/Pacific Islander	8.5
Hispanic Origin	8.5
Mexican American	8.1
Puerto Rican	10.9
Cuban	7.7
Central/South American	7.8
Other and unknown Hispanic	9.1
Non-Hispanic White	8.4
Non-Hispanic Black	17.9

Source: National Center for Health Statistics, 1993a.

low birth weight babies. In fact, all the women were teen mothers over the course of the study. The prior low birth weight v study emphasize that factors a birth weight.

The higher infant mortality rates for black infants and the higher rates for black infants (Schoendorf et al. (1992) 1985, they found that black infants because of their higher birth weight had equivalent n

During the 1991 Longitudinal data were collected on low birth weight babies are not yet available.

**Birth Defects.** National Center for Birth Defects premature mortality, stillbirth prevalence of one category of social class and nutritional de

TABLE 11. Low Birth Weight (&lt; 2,500 grams) Live Births by Race and Hispanic Origin of Mother: United States, 1991

Race/Ethnic Origin	Percent of Live Births
White	5.8%
Black	13.6
American Indian/Alaskan Native	6.2
Asian/Pacific Islander	—
Chinese	5.1
Japanese	5.9
Hawaiian	6.7
Filipino	7.3
Other Asian/Pacific Islander	6.7
Hispanic Origin	6.1
Mexican American	5.6
Puerto Rican	9.4
Cuban	5.6
Central/South American	5.9
Other and unknown Hispanic	7.2
Non-Hispanic White	5.7
Non-Hispanic Black	13.6

Source: National Center for Health Statistics, 1993b.

low birth weight babies. (Poverty was measured: 1) in year of sample selection when almost all the women were teenagers, 2) in the calendar year that pregnancy began, and 3) as a pattern over the course of the majority of the study years from 1979-1988.) Since prior poverty and prior low birth weight were strong correlates of subsequent low birth weight, these findings emphasize that factors antecedent to the specific pregnancy are important in the genesis of low birth weight.

The higher infant mortality rate for blacks reflects both the higher rates of low birth weight for black infants and the higher mortality among black infants of normal birth weight. When Schoendorf et al. (1992) focused on infants born to college-educated parents between 1983 and 1985, they found that black infants have higher mortality rates than similar white infants only because of their higher rates of low birth weight. Black and white infants of normal birth weight had equivalent mortality rates.

During the 1991 Longitudinal Followup to the National Maternal and Infant Health Survey, data were collected on developmental disabilities in low birth weight children, but these data are not yet available.

*Birth Defects.* National data on the prevalence of congenital malformations and subsequent premature mortality, stratified by measures of social class, have not been analyzed. But the prevalence of one category of birth anomalies, neural tube defects, has been linked to social class and nutritional deficits (Kiely, 1991; Medical Research Council, 1991). Infant mortality

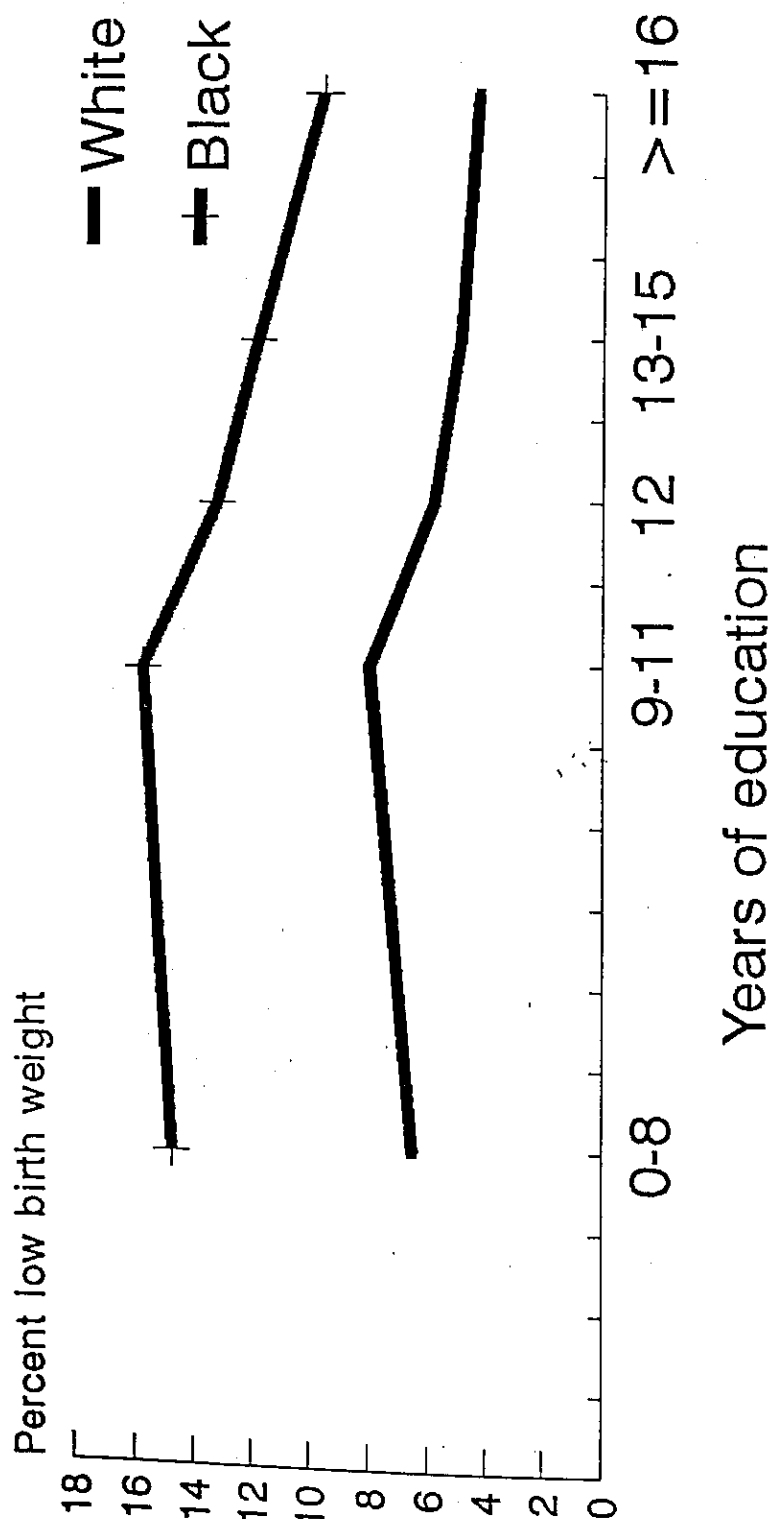


FIGURE 2. Percent low birth weight by educational attainment and race of mother: 48 reporting states, District of Columbia, and New York City, 1989. Source: Unpublished 1989 Natality Data. Note: Low birth weight is defined as weight < 2,500 grams.

rates for infants with congenital anomalies and for 11 Health Statistics, 1993). malformations with maternal age, education, and minority mothers living near waste dump site and to have malformations than babies

*Small for Gestational Age* sensitive to socioeconomic status. a higher rate of infants with a percentile of birth weight living below the poverty line for both races. But the rate among black mothers. According to the Census Bureau population above 185% of the index.

The rate of SGA infant occupations. Within each gestational age than white infants in the same professional/managerial any occupation-specific investigators have caused (professional/managerial and 1990s. Conceptual included in the discussion

*Iron Deficiency.* Nutrition and interfere with the body deficiency is more common line than for those living American women studied (HHANES) during 1987 Nutrition Examination American women had a higher

Information on hematocrit other minority groups, including

rates for infants with congenital malformations are higher for blacks than for whites, both for total anomalies and for 11 of 12 categories of anomalies (data not shown) (National Center for Health Statistics, 1993). Geschwind et al. (1992) found an increased risk of congenital malformations with maternal residential proximity to hazardous waste sites in New York. Minorities and persons with little education were more likely to live within a mile of a toxic waste dump site and to have an infant born with a congenital malformation. After adjusting for maternal age, education, complications during pregnancy, and parity and sex of child, babies of minority mothers living close to hazardous waste sites still had a higher rate of congenital malformations than babies of white mothers who lived close to hazardous waste sites.

*Small for Gestational Age.* Fetal growth retardation is a pregnancy outcome especially sensitive to socioeconomic deprivation (Parker et al., 1992). Compared to whites, blacks have a higher rate of infants who are small for gestational age (SGA), defined as below the tenth percentile of birth weight for gestational age. The rate of SGA infants is highest for mothers living below the poverty index and for mothers whose usual occupation is "laborer or operator" for both races. But the associations for both measures are larger among white mothers than among black mothers. Among whites, those who are near-poor (those with incomes 100-185% of the Census Bureau poverty level) have a higher risk for SGA than those with incomes above 185% of the index.

The rate of SGA infants is lowest for mothers who work in professional or managerial occupations. Within each occupational category, black infants were more likely to be small for gestational age than white infants with rates for black infants approximately twice those for white infants in the same occupational category. In fact, black mothers who work in professional/managerial occupations had a rate of SGA infants that was higher (15.7%) than any occupation-specific rate for whites. However, in interpreting these differences, the investigators have cautioned that the Bureau of the Census' occupational categories (professional/managerial, etc.) may not be relevant for studies of black women in the 1980s and 1990s. Conceptual and methodological issues about gender, race and occupation are included in the discussion of the measurement of social class.

*Iron Deficiency.* Nutritional deficiencies impair the normal functioning of the immune system and interfere with the body's defenses against pollutants. As can be seen in Table 12, iron deficiency is more common for women of reproductive age who are living below the poverty line than for those living above it (Life Sciences Research Office, 1989). Comparing Mexican American women studied in the Hispanic Health and Nutrition Examination Survey (HHANES) during 1982-1983 with all women studied in the second National Health and Nutrition Examination Survey (NHANES II) during 1976-1980, we find that Mexican American women had a higher prevalence of iron deficiency than all women in NHANES II.

Information on hematocrit results, an indication of the prevalence of iron deficiency among other minority groups, is available from the Centers for Disease Control (CDC) Pregnancy

FIGURE 2. Percent low birth weight by educational attainment and race of mother: 48 reporting states, District of Columbia, and New York City, 1989. Source: Unpublished 1989 Natality Data. Note: Low birth weight is defined as weight < 2,500 grams.

**TABLE 12.** Percent of 16-49 Year Old Females with Iron Deficiency by Hispanic Origin, Age, and Poverty Status

Hispanic Origin	Poverty	Not Poverty
Mexican American*		
16 - 19 years	9.2%	6.3%
20 - 29 years	9.6	7.7
30 - 39 years	14.6	9.8
40 - 49 years	19.2	9.8
Total United States**		
16 - 19 years	8.7%	3.6%
20 - 29 years	3.7	2.5
30 - 39 years	10.7	5.8
40 - 49 years	10.1	7.1

Source: Life Sciences Research Office, 1989.

\*Hispanic Health and Nutrition Examination Survey (1982-1983).

\*\* Second National Health and Nutrition Examination Survey (1976-1980).

Nutrition Surveillance System. Hematocrit is the percentage of a given volume of blood occupied by red blood cells. If the percentage is low, there are fewer red blood cells and hence less iron-carrying hemoglobin. During 1987, the prevalence of low hematocrit among pregnant women varied by race/ethnic origin: 24.2% of blacks, 15.2% of Asian Americans, 13.6% of Hispanics, 9.4% of whites, and 9.1% of American Indians (Life Sciences Research Office, 1989).

**Prenatal Care.** Until the problem of improved access to health care is addressed, pregnant women cannot be adequately screened for exposures that may potentially harm the fetus, nor can such risks be adequately reduced once identified. Data from the birth certificate portion of the 1988 National Maternal and Infant Health Survey indicate that blacks, American Indians, and Hispanics are much more likely to receive prenatal care late in their pregnancy or not at all (Table 13). Mothers with less than a high school education were the most likely to receive their prenatal care either late or not at all.

**TABLE 13.** Percent of Mothers Receiving Late or No Prenatal Care by Race/Ethnicity: 1988

Education	White	Black	Asian/Pacific Islander	American Indian	Hispanic*
< High school	6.9%	10.8%	2.0%	14.9%	7.3%
High school graduate	2.8	6.6	1.0	4.9	6.7
> High school	1.3	3.4	3.2	9.1	0.8

Source: 1988 National Maternal and Infant Health Survey.

\* Hispanics can be of any race.

**Smoking During Pregnancy.** Maternal and Infant Health Survey women reported that the women with high school education, 4% of mothers, 89% of American Indian mothers, not smoke. White women smoke more cigarettes, than

**Alcohol Consumption During Pregnancy.** Hispanics with less than high school education with more than a high school education are more likely to drink three or more other racial/ethnic groups. Approximate education, and one-third reported drinking at least

#### Children's Health

A logistic regression analysis found that the difference in children with one or more chronic conditions over the 14-year period for children as likely as children in 1 more likely to be limited times more likely to be children to have a disability

In addition, poverty was a significant factor for children. When family income was controlled (1992), the apparent effect was reduced on the general health for black children with poverty account (Table 16). The odds ratio of 1.24 for black children in the model (Table 17).

**Blood Lead Levels.** White and 5 years were found to be 25 µg/dl. These racial differences in attainment (Table 18), differences in households with an average

Deficiency by

Poverty

6.3%  
7.7  
9.8  
9.8

3.6%  
2.5  
5.8  
7.1

n volume of blood  
lood cells and hence  
crit among pregnant  
mericans, 13.6% of  
es Research Office,

addressed, pregnant  
y harm the fetus, nor  
certificate portion of  
s, American Indians,  
pregnancy or not at all  
most likely to receive

Prenatal Care by

American Indian	Hispanic*
4.9%	7.3%
4.9	6.7
9.1	0.8

**Smoking During Pregnancy.** Data from the questionnaire portion of the 1988 National Maternal and Infant Health Survey show smoking levels during pregnancy (Table 14). Most women reported that they did not smoke during pregnancy; of those women with less than a high school education, 45.6% of white mothers, 71% of black mothers, 86% of Hispanic mothers, 89% of American Indian mothers, and almost 100% of Asian American mothers did not smoke. White women without a high school education were more likely to smoke, and to smoke more cigarettes, than were women from other racial/ethnic groups.

**Alcohol Consumption During Pregnancy.** More mothers reported drinking alcohol during pregnancy than reported smoking during pregnancy; data ranged from a low of 31.9% for Hispanics with less than a high school education to a high of 87.6% for American Indians with more than a high school education (Table 15). Black and Asian American mothers were more likely to drink three or more drinks per week during pregnancy than were mothers from other racial/ethnic groups, except for American Indian mothers having more than a high school education. Approximately half of Asian American mothers with less than a high school education, and one-third of American Indian mothers with more than a high school education, reported drinking at least three alcoholic drinks per week during their pregnancy.

*Children's Health*

A logistic regression analysis of data from the National Health Interview Survey (NHIS) found that the difference in children's health and disability (i.e., limitation of major activity because of one or more chronic conditions) by family socioeconomic status has significantly increased over the 14-year period from 1976 to 1989. In 1976-1977, children in poor families were twice as likely as children in higher-income families to be in fair/poor health, and they were 59% more likely to be limited in their major activity. In 1988-1989, poor children were nearly three times more likely to be in fair or poor health and about twice as likely as higher-income children to have a disabling chronic condition.

In addition, poverty was a stronger predictor than race of fair/poor health and of disability in children. When family income was included in a multivariate logit model (Montgomery, 1992), the apparent effect of race, which is observed in NHIS data every year, was greatly reduced on the general health measure and eliminated on the disability measure. The odds ratio for black children with poor or fair health fell from 2.08 to 1.54 when income was taken into account (Table 16). The effect of race was eliminated from the disability measure, where the odds ratio of 1.24 for black children became nonsignificant at 1.04 when income was included in the model (Table 17).

**Blood Lead Levels.** When compared to whites, black children between the ages of 6 months and 5 years were found to have a higher prevalence of blood lead levels greater than or equal to 25 µg/dl. These racial disparities continued within categories of income and educational attainment (Table 18), despite a large social class differential. Black and white children living in households with an annual income of less than \$6,000, and children living with a head of

TABLE 14. Percent of Mothers Reporting Smoking During Pregnancy by Number of Cigarettes per Day, Race/Ethnic Origin, and Education

	White	Black	Asian American	American Indian	Hispanic
< High school					
Non-smoker	45.6%	71.1%	99.9%	89.1%	85.7
1-10 cigarettes/day	29.3	21.6	0.0	4.9	11.4
11-20 cigarettes/day	18.2	6.0	0.0	5.9	1.5
21+ cigarettes/day	6.9	1.3	0.0	0.1	1.4
High school graduate					
Non-smoker	69.4%	80.8%	84.6%	76.9%	89.1
1-10 cigarettes/day	18.1	15.0	9.6	16.4	8.0
11-20 cigarettes/day	10.3	3.5	5.8	5.8	2.8
21+ cigarettes/day	2.2	0.7	0.0	1.0	0.1
> High school					
Non-smoker	86.4%	85.5%	97.8%	72.4%	90.2
1-10 cigarettes/day	8.2	12.0	2.2	17.7	8.7
11-20 cigarettes/day	5.0	2.0	0.0	9.9	1.1
21+ cigarettes/day	0.4	0.6	0.0	0.0	0.0

Source: 1988 National Maternal and Infant Health Survey.



TABLE 15. Percent of Mothers Reporting Alcohol Consumption During Pregnancy by Number of Drinks per Week, Race/Ethnic Origin, and Educational Attainment

	White	Black	Asian American	American Indian	Hispanic
< High school					
No drinks	60.6%	43.6%	38.7%	45.3%	68.1%
1-2 drinks/week	35.5	43.6	10.1	53.8	24.2
3+ drinks/week	3.9	12.8	51.2	0.9	7.7
High school graduate					
No drinks	57.0%	56.7%	50.8%	55.5%	52.2%
1-2 drinks/week	40.5	35.0	30.6	44.3	47.0
3+ drinks/week	2.5	8.3	18.6	0.2	0.8
> High school					
No drinks	50.9%	59.6%	62.7%	12.4%	62.6%
1-2 drinks/week	46.9	36.5	32.6	56.8	37.4
3+ drinks/week	2.2	4.0	4.7	30.8	0.0

Source: 1988 National Maternal and Infant Health Survey.

**TABLE 16. Effects of Race and Poverty on Health Status of Children and Youth from 1976-1989**

Characteristics	Model 1		Model 2	
	Beta	Odds Ratio	Beta	Odds Ratio
Race - black	0.72997*	2.08	0.43392*	1.54
Income - below 150% poverty			0.90484*	2.47

Source: CDC/NCHS, National Health Interview Survey, 1976-1989.

Model 2 controls for family income.

\*  $p < 0.001$ .**TABLE 17. Effects of Race and Poverty on Disability of Children and Youth from 1976-1989**

Characteristics	Model 1		Model 2	
	Beta	Odds Ratio	Beta	Odds Ratio
Race - black	0.21429*	1.24	0.03628 NS	1.04
Income - below 150% poverty			0.53607*	1.71

Source: CDC/NCHS, National Health Interview Survey, 1976-1989.

Model 2 controls for family income.

\*  $p < 0.001$ .

household who had received less than a high school education, were at highest risk of elevated blood lead (Annest and Mahaffey, 1984). This social class gradient was also seen for Mexican American and Puerto Rican children in HHANES (Table 19) (Carter-Pokras, 1990).

**TABLE 18. Percent of 6 Month- 5-Year-Olds with Elevated Blood Lead ( $\geq 25 \mu\text{g/dl}$ ) by Race and Socioeconomic Status**

Socioeconomic Status Indicator	White	Black
Annual income		
< \$6,000	14.0	34.2
\$6,000 - \$14,999	5.6	23.6
$\geq$ \$15,000	3.3	8.0
Education of head of household		
< High school	17.9	22.2
High school graduate	15.1	21.4
$\geq$ College	13.9	18.0

Source: Annest, 1984.

A blood lead level of 10 to 15  $\mu\text{g/dl}$  has been associated with undesirable toxicity in children and pregnant women. According to Lin-Fu, "Current literature suggests that there may be no threshold for the toxic effects of lead on human metabolism and neurophysiology" (Lin-Fu, 1992, p. 36). Relatively "low" levels of lead exposure in children are associated with

**TABLE 19. Mean Origin**

Socioeconomic Status
Living in poverty
Not living in poverty

Education of head of household

0 - 6 years

7 - 11 years

High school graduate

Source: Carter-Pokras, 1990.

psychoneurological damage, eye/hand coordination, lower class standing, income later in life (Needleman reviewed a century of lead exposure in relation to lead impair children's intelligence (Fu, 1992).

**Growth.** Children's anthropometric status. Mean weight lower for children living in poverty (Ryan et al., 1990). An association was found in both NHANES (1991).

**Vision Problems.** Children have inadequate usual vision (Gergen, 1985). No vision problems than normal.

**TABLE 20. Percent of Children with Elevated Blood Lead by Race and Socioeconomic Status**

Race/Ethnic Origin
Mexican American*
Non-Hispanic White**
Non-Hispanic Black**

Source: Gergen, 1985.

\*Hispanic Health and Nutrition Examination Survey

\*\*First National Health and Nutrition Examination Survey

**TABLE 19. Mean Blood Lead Among 4- to 11-Year-Olds by Ethnic Origin and Socioeconomic Status Indicators: 1982-1984**

Socioeconomic Status Indicator	Mexican American	Puerto Rican
Living in poverty	11.6 µg/dl	11.9 µg/dl
Not living in poverty	9.6 µg/dl	11.0 µg/dl
Education of head of household		
0 - 6 years	12.0 µg/dl	11.7 µg/dl
7 - 11 years	10.1 µg/dl	12.0 µg/dl
High school graduate	9.2 µg/dl	10.7 µg/dl

Source: Carter-Pokras, 1989.

psychoneurological damage and with maladaptive behavioral effects. These effects include poor eye/hand coordination, higher risk of reading disabilities and of dropping out of high school, lower class standing, increased absenteeism, and other deficits that contribute to school failure later in life (Needleman et al., 1990; Bellinger et al., 1992; Sciarillo, 1992). Lin-Fu recently reviewed a century of lead studies (1992). A meta-analysis of 24 modern studies of childhood lead exposure in relation to IQ strongly supported the hypothesis that even very low doses of lead impair children's intellectual performance (Needleman and Gatsonis, 1990, cited in Lin-Fu, 1992).

**Growth.** Children's anthropometry data from NHANES I and II have been analyzed by race and poverty status. Mean values for height, weight, and other growth measures were generally lower for children living below the poverty line than those living above it (Jones et al., 1985; Ryan et al., 1990). An association between blood lead levels and decreased stature in children was found in both NHANES II and HHANES (Schwartz et al., 1986; Frisncho and Ryan, 1991).

**Vision Problems.** Children between the ages of 6 and 17 living in poverty were more likely to have inadequate usual monocular distance vision in the worst eye than other children (Table 20) (Gergen, 1985). NonHispanic black and Mexican American children had higher rates of vision problems than nonHispanic white children, even within poverty status categories.

**TABLE 20. Percent of 6- to 17-Year-Olds with Inadequate Usual Monocular Distance Vision in the Worst Eye by Race/Ethnic Origin and Poverty Status**

Race/Ethnic Origin	Total	Below Poverty	At or Above Poverty
Mexican American*	13.8%	15.5%	12.7%
Non-Hispanic White**	9.5	13.5	9.1
Non-Hispanic Black**	14.6	18.7	10.5

Source: Gergen, 1985.

\*Hispanic Health and Nutrition Examination Survey (1982-1983).

\*\*First National Health and Nutrition Examination Survey (1971-1974).

**Hearing Problems.** Poor children were also more likely to have inadequate hearing than other children (Table 21) (Gergen, 1985). Although the overall rate of hearing problems was similar for Mexican Americans, nonHispanic whites, and blacks, when rates within poverty status categories were compared, nonHispanic whites had the highest rate of hearing problems of the three groups studied. This finding is consistent with findings from other studies. One possible explanation for the higher rate of hearing problems among whites is that white infants are more likely to survive their first year of life. The fact that black infants have higher infant mortality rates due to congenital anomalies compared to white infants supports this explanation (National Center for Health Statistics, 1993).

**TABLE 21. Percent of 6- to 17-Year-Olds with Inadequate Hearing in the Worst Ear by Race/Ethnic Origin and Poverty Status (Average Hearing at 500, 1000, 2000 Hz Greater than 20 db)**

Race/Ethnic Origin	Total	Poverty	Not Poverty
Mexican American*	3.9%	4.9%	3.3%
Non-Hispanic White**	3.9	6.1	3.7
Non-Hispanic Black**	4.0	5.7	2.7

Source: Gergen, 1985.

\*Hispanic Health and Nutrition Examination Survey (1982-1983).

\*\*Second National Health and Nutrition Examination Survey (1976-1980).

**Asthma.** On the basis of self-report of previous physician's diagnosis of asthma, non-Hispanic blacks and Puerto Ricans have the highest rates of active and lifetime asthma when compared to other race/ethnic groups (see Figure 3) (Carter-Pokras and Gergen, 1993). The increased prevalence of asthma among black children compared with white children is not explained by socioeconomic status (Gergen et al., 1988). Although some studies have found no relationship between asthma prevalence and poverty, Weitzman et al. (1990) found that when social and environmental characteristics of a poverty-related environment were controlled (i.e., poverty status, large family size, smaller size of home, maternal cigarette smoking, maternal age under 20 years at child's birth, and low birth weight), the increased risk of asthma among black children was not significant.

Since no independent effect of poverty was found after controlling for these poverty-related factors, it appears that characteristics of a poverty-related environment, rather than income itself, contributed significantly to the elevated rates of asthma among children living in poverty. The magnitude of the effect of socioeconomic status on asthma prevalence appears smaller than the effect of socioeconomic status on measures of asthma morbidity, such as hospitalization and mortality (Weiss et al., 1992).

**Iron and Vitamin A Deficiencies.** Nutritional deficiencies increase a child's susceptibility to toxic exposures (Calabrese, 1980, 1984). Iron and vitamin A are two examples of nutrients for which we have data. Generally, children living below the poverty threshold have higher rates

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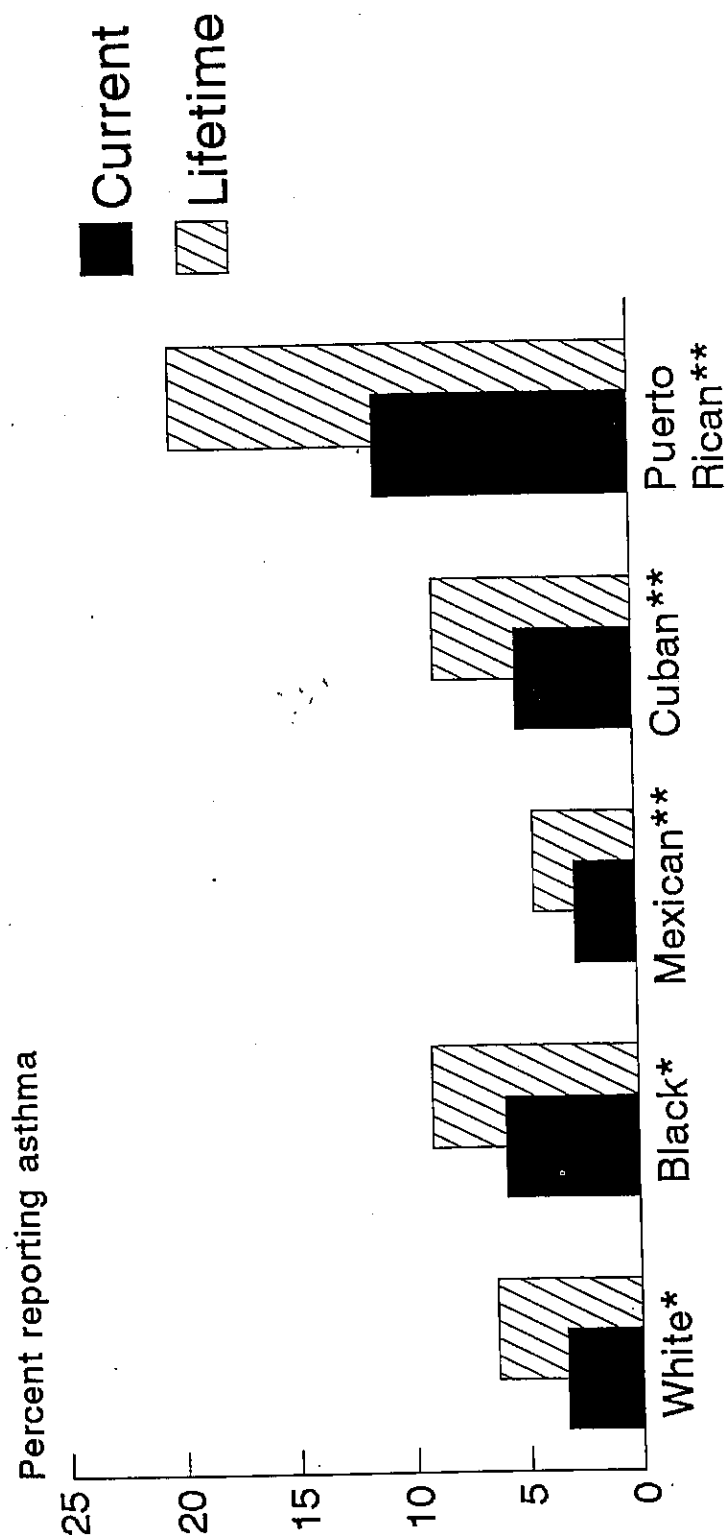
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## Race/Ethnicity

FIGURE 3. Lifetime and point prevalence of reported asthma among 6 month to 11-year-olds by race and ethnicity. Source: Carter-Pokras, 1993.  
\*NHANES II (1976-80); \*\* HHANES (1982-84).

of iron deficiency than other children (Table 22). Mexican Americans generally have lower rates of iron deficiency than all children in the United States.

**TABLE 22. Percent of 4- to 11-Year-Old Children with Iron Deficiency by Hispanic Origin, Age, and Poverty Status**

Age and Hispanic Origin	Poverty	Not Poverty
Mexican American*		
4 - 5 years	3.3%	3.8%
6 - 11 years	4.1	2.8
Total United States**		
4 - 5 years	6.4%	4.2%
6 - 11 years	3.8	3.3

Source: Life Sciences Research Office, 1989.

\*Hispanic Health and Nutrition Examination Survey (1982-1983).

\*\*Second National Health and Nutrition Examination Survey (1976-1980).

In a comparison of NHANES II and HHANES data, children between the ages of 4 and 11 years living below the poverty threshold had a higher prevalence of low serum vitamin A than other children (Looker et al., 1988). Mexican American children had higher prevalences of low serum vitamin A than nonHispanic white children, even within poverty status categories (Table 23).

**TABLE 23. Percent of 4- to 11-Year-Old Children with Low Serum Vitamin A (< 25 µg/dl) by Race/Ethnic Origin, Age, and Poverty Status**

Race/Ethnic Origin	Poverty	Not Poverty
Mexican American*		
4 - 5 years	30.3%	N/A
6 - 11 years	16.3	10.2%
Non-Hispanic White**		
4 - 5 years	17.3%	15.6%
6 - 11 years	7.2	8.5

Source: Looker, 1988.

\*Hispanic Health and Nutrition Examination Survey (1982-1983).

\*\*Second National Health and Nutrition Examination Survey (1976-1980).

#### *Adult Morbidity*

Although cardiovascular and liver disease have been linked to environmental exposures in the past, federal databases provide little information on a national level for cardiovascular or liver disease morbidity by race/ethnic origin and/or by socioeconomic position. Information on disease rates by race/ethnic origin is, however, available for cancer, pulmonary disease, kidney disease, hypertension, and obesity; these are discussed in the following subsections.

**Cancer.** Cancer incidence by socioeconomic position and minority status has been found that controlling for socioeconomic position found that controlling for apparent disparities between many cancers are largely due to socioeconomic position. A recent analysis of data from the End Results Program (1973-1980) found that lower socioeconomic levels had higher rates of cancer (Table 24). Whites, blacks (Table 24). Whites, blacks had a lower incidence of cancer sites (Baquet et al., 1989). Stomach, cervix uteri, and breast after adjusting for socioeconomic position were higher for whites, but colon cancer were not re-

Findings from the report of the Society, 1986) show similar findings for socioeconomic component, but after adjustment usually is reduced or eliminated with some cancer sites in socioeconomic class measures.

**Pulmonary Disease.** Cohort Studies were used to examine the relationship between and family income (Riechers et al., 1989) higher for those with family income persons (Table 24) than whites, while rates of differences generally persisted with unpublished data based on the first National Health and Nutrition Examination Survey (NHANES I Epidemiologic) prevalence of chronic obstructive pulmonary disease were higher for whites, but when income is added to the model, asthma in blacks is reduced.

Although whites have higher rates of heart disease, despite higher rates of heart disease, and cerebro-

**Cancer.** Cancer incidence, survival, and mortality are all strongly related to socioeconomic position and minority status. Multivariate analyses that have considered both factors have found that controlling for socioeconomic status greatly reduces (and sometimes eliminates) the apparent disparities between race/ethnic groups, suggesting that minority status differences in many cancers are largely secondary to socioeconomic factors and their associated processes. A recent analysis of data from the National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER) suggests that the disproportionately high number of blacks at lower socioeconomic levels accounts for much of the excess cancer incidence observed among blacks (Table 24). When age-adjusted incidence data were also adjusted for socioeconomic status, blacks had a lower risk of cancer at all sites combined and at three of the seven separate sites (Baquet et al., 1991). But blacks continued to have higher cancer incidence of the stomach, cervix uteri, and prostate gland, while whites had higher rates of cancer of the female breast after adjusting for socioeconomic status. Lung and bronchus cancer incidence rates also were higher for whites, instead of blacks, after adjustment for socioeconomic status. Rates for colon cancer were not related to educational level, family income or race.

Findings from the report "Cancer in the Economically Disadvantaged" (American Cancer Society, 1986) show similar results, in that certain sites may appear to have a specific racial component, but after adjusting for socioeconomic position, the original race relationship usually is reduced or eliminated. It remains unknown whether the race component associated with some cancer sites is due to cultural or genetic factors, or is the result of inadequate social class measures.

**Pulmonary Disease.** Combined data from the 1985, 1986, and 1987 National Health Interview Surveys were used to examine self-reported rates of chronic bronchitis and asthma by age, race, and family income (Ries, 1990). Prevalence rates of both chronic bronchitis and asthma were higher for those with family incomes of less than \$20,000 when compared to rates for higher-income persons (Table 25). But prevalence rates of chronic bronchitis were lower for blacks than whites, while rates of asthma were generally higher for blacks than whites. Such racial differences generally persisted within family income categories. These findings are consistent with unpublished data from the 1990 National Health Interview Survey, published findings based on the first National Health and Nutrition Examination Survey (NHANES I), and the NHANES I Epidemiologic Followup Study (NHEFS) (McWhorter et al., 1989). Incidence and prevalence of chronic obstructive pulmonary disease (COPD) during NHANES I and NHEFS were higher for whites, but asthma incidence and prevalence were higher for blacks. However, when income is added to the regression model with age, sex, and race, the excess risk of asthma in blacks is reduced to statistical nonsignificance.

Although whites have greater cumulative cigarette smoking exposure than blacks (McWhorter et al., 1989), the paradox of lower COPD mortality and morbidity in blacks compared to whites, despite higher mortality from other diseases attributable to smoking (i.e., lung cancer, heart disease, and cerebrovascular disease), has not been adequately examined (Gillum, 1991).

TABLE 24. Age-Adjusted Cancer Incidence Rates per 100,000 Population by Race and SES\*: 1978-1982, San Francisco-Oakland, Detroit and Atlanta

Cancer Site	Cancer Incidence		Differences by SES*	Racial Differences After Adjustment for SES*
	Whites	Blacks		
All sites combined	358.4	383.2	Higher for low SES	Higher for Whites
Lung and bronchus	58.6	70.8	Higher for low SES	Higher for Whites
Stomach	8.7	14.3	Not related to education/income	Lower for Whites
Colon, excluding rectum	35.2	37.9	Not related to education/income	Similar rates
Rectum and rectosigmoid	15.2	11.6	Not related to education/income	Higher for Whites
Female breast	92.0	74.2	Lower for low SES (Whites only)	Higher for Whites
Cervix uteri	9.1	20.4	Higher for low SES (Whites only)	Lower for Whites
Prostate gland	74.5	126.4	Not related to education/income	Lower for Whites

Source: Baquet, 1991.

\*Socioeconomic status (SES) indicators: education, income.

TABLE 25. B

Respiratory Cond
Chronic Bronch
Total
< \$20,000
≥ \$20,000
Asthma
Total
< \$20,000
≥ \$20,000

Source: Adapted from  
\*Due to small sample

Even though chronic  
frequent in persons  
status do not explain  
studies have reported  
lower forced vital capacity

Information regarding  
Although not shown  
for Puerto Ricans and  
Americans and Cubans

**Kidney Disease.** Based  
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The relative risk of  
(Kasiske et al., 1999)  
disease, although on  
renal disease among  
blacks have an increased

Focusing on diabetes  
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(NIDDM) had a fivefold  
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is not fully explained  
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risk of renal failure



**TABLE 25. Black-White Ratio of Self-Reported Prevalence Rates of Chronic Respiratory Conditions by Age and Family Income**

Respiratory Condition	Age		
	< 45 years	45 - 64 years	≥ 65 years
Chronic Bronchitis			
Total	0.67	0.75	0.55
< \$20,000	0.73	0.72	*
≥ \$20,000	0.54	*	*
Asthma			
Total	1.06	0.94	1.23
< \$20,000	1.18	1.08	1.17
≥ \$20,000	0.76	*	*

Source: Adapted from Ries, 1990.

\*Due to small sample sizes for blacks, estimate is unreliable.

Even though chronic bronchitis, emphysema, and asthma are often reported to be more frequent in persons with lower socioeconomic status, racial differences in socioeconomic status do not explain reported differences in chronic bronchitis, emphysema, or asthma. Many studies have reported lower lung volumes, smaller lung field areas and thoracic diameters, and lower forced vital capacity for blacks when compared to whites (Gillum, 1991).

Information regarding pulmonary disease rates among other groups is not as easily available. Although not shown, analysis of HHANES data found higher self-reported rates of bronchitis for Puerto Ricans between the ages of 12 and 74 when compared to similar rates for Mexican Americans and Cubans (Bang et al., 1990).

**Kidney Disease.** Because the kidney is one of the major organs that removes toxic substances from the blood, individuals with kidney disease are less able to eliminate harmful substances. The relative risk of end-stage renal disease is about fourfold higher for blacks than for whites (Kasiske et al., 1991). In 1987, blacks accounted for 27% of the patients with end-stage renal disease, although only 12% of the U.S. population was black. This increased risk of end-stage renal disease among blacks cannot be attributed to any single cause of renal disease, although blacks have an increased prevalence of hypertension and diabetes.

Focusing on diabetic end-stage renal disease among blacks and whites in Maryland between 1980 and 1985, Brancati et al. (1992) found that blacks with noninsulin-dependent diabetes (NIDDM) had a fivefold higher risk of end-stage renal disease than NIDDM whites. Brancati et al. (1992) concluded that the excess incidence of NIDDM end-stage renal disease among blacks is not fully explained by a higher prevalence rate of diabetes or hypertension in blacks or by racial differences in age, educational attainment, or access to health care.

Although not as well documented, other racial and ethnic minorities may also be at increased risk of renal failure. The overall risk of end-stage renal disease for adult Native Americans is

approximately three times that for whites (Newman et al., 1990). This increased risk may be due to a higher incidence of diabetes mellitus and glomerulonephritis (Smith and Tung, 1985; Hoy et al., 1987, 1989; Megill and Hoy, 1989; Nelson and Bennett, 1989; Teutsch et al., 1989; Newman et al., 1990). Hispanics in Texas were also found to have a rate of end-stage renal disease that was three times the rate for whites (Pugh et al., 1988).

**Hypertension.** Hypertension has been cited as a potential susceptibility factor for the health effects of toxic exposures. It has also been linked to lead exposure (Harlan et al., 1985; Pirkle et al., 1985; Sorel et al., 1991). Data from NHANES II and HHANES suggest that nonHispanic blacks have much higher rates of hypertension than Hispanics and nonHispanic whites (see Figure 4) (National Center for Health Statistics, 1991a). Further analysis of NHANES II and HHANES data suggests that within educational attainment categories, blacks do not have significantly higher age-adjusted mean systolic or diastolic blood pressure than whites (Sorel et al., 1992). Although systolic and diastolic blood pressures were lowest for women having the highest educational attainment when compared to other women, the primary mechanism by which socioeconomic status is related to high blood pressure appears to be through the body mass index.

**Overweight.** Being overweight indicates that a person has significant stores of body fat. During a period when significant weight is lost, an overweight person may experience health effects of previous toxic exposures (e.g., from pesticides stored in fat). More Hispanic women and nonHispanic black women are overweight than nonHispanic white women. Hispanic and nonHispanic black men are also overweight at higher rates than nonHispanic white men (Figure 5) (National Center for Health Statistics, 1991a). NHANES II and HHANES data suggest that Mexican American and nonHispanic white women living in poverty are more likely to be overweight than women not living in poverty (Table 26) (Life Sciences Research Office, 1989).

TABLE 26. Age-Adjusted Percent of 20- to 74-Year-Olds Who Are Overweight by Ethnic Origin, Sex, and Poverty Status

Sex and Ethnic Group	Living in Poverty	Not Living in Poverty
Men		
Mexican American*	31.8%	31.1%
Non-Hispanic**	21.5	24.6
Women		
Mexican American*	46.1%	40.1%
Non-Hispanic**	38.5	24.6

Source: Life Sciences Research Office, 1989.

\*Hispanic Health and Nutrition Examination Survey (1982-1983).

\*\*Second National Health and Nutrition Examination Survey (1976-1980).

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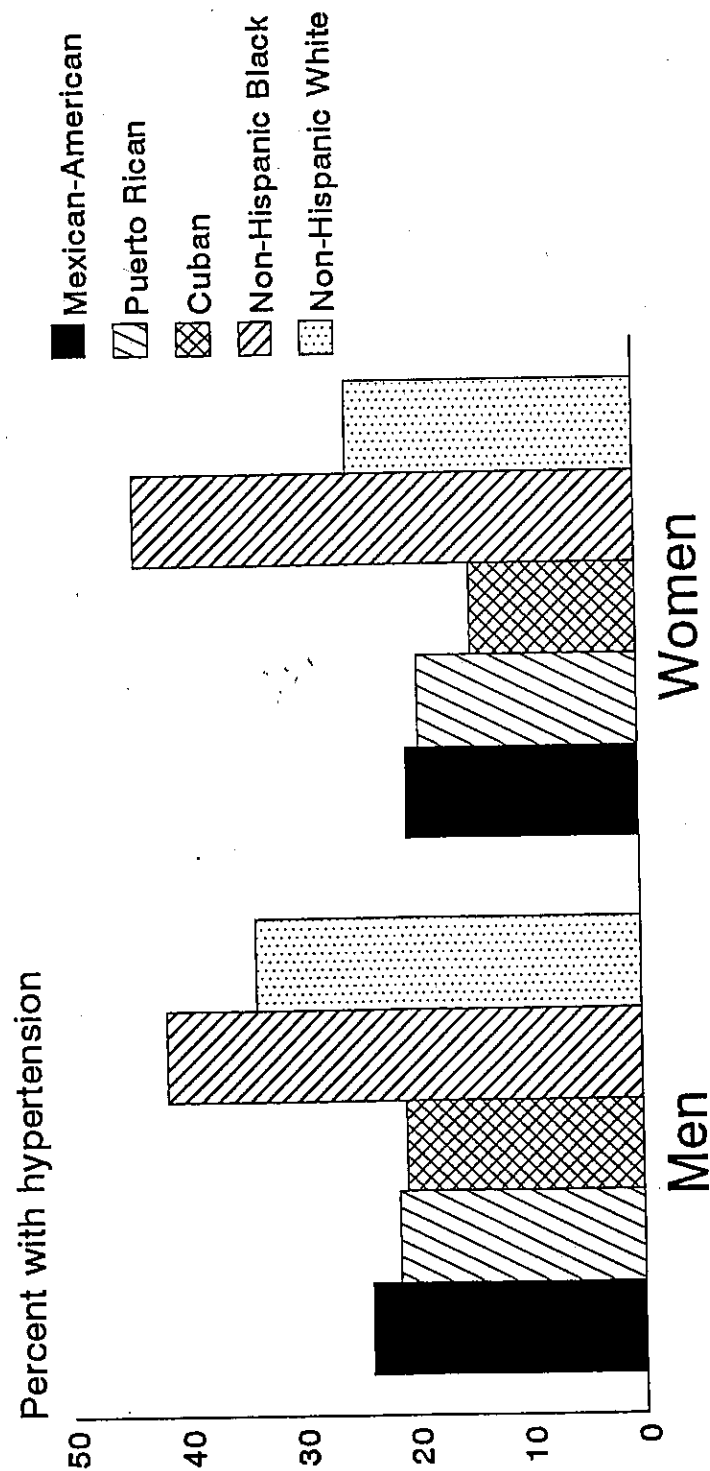


FIGURE 4. Age-adjusted percent of 20- to 74-year-olds with hypertension by race/ethnic origin and sex. Source: National Center for Health Statistics, 1991. \*HHANES (1982-84); \*\* NHANES II (1976-80).

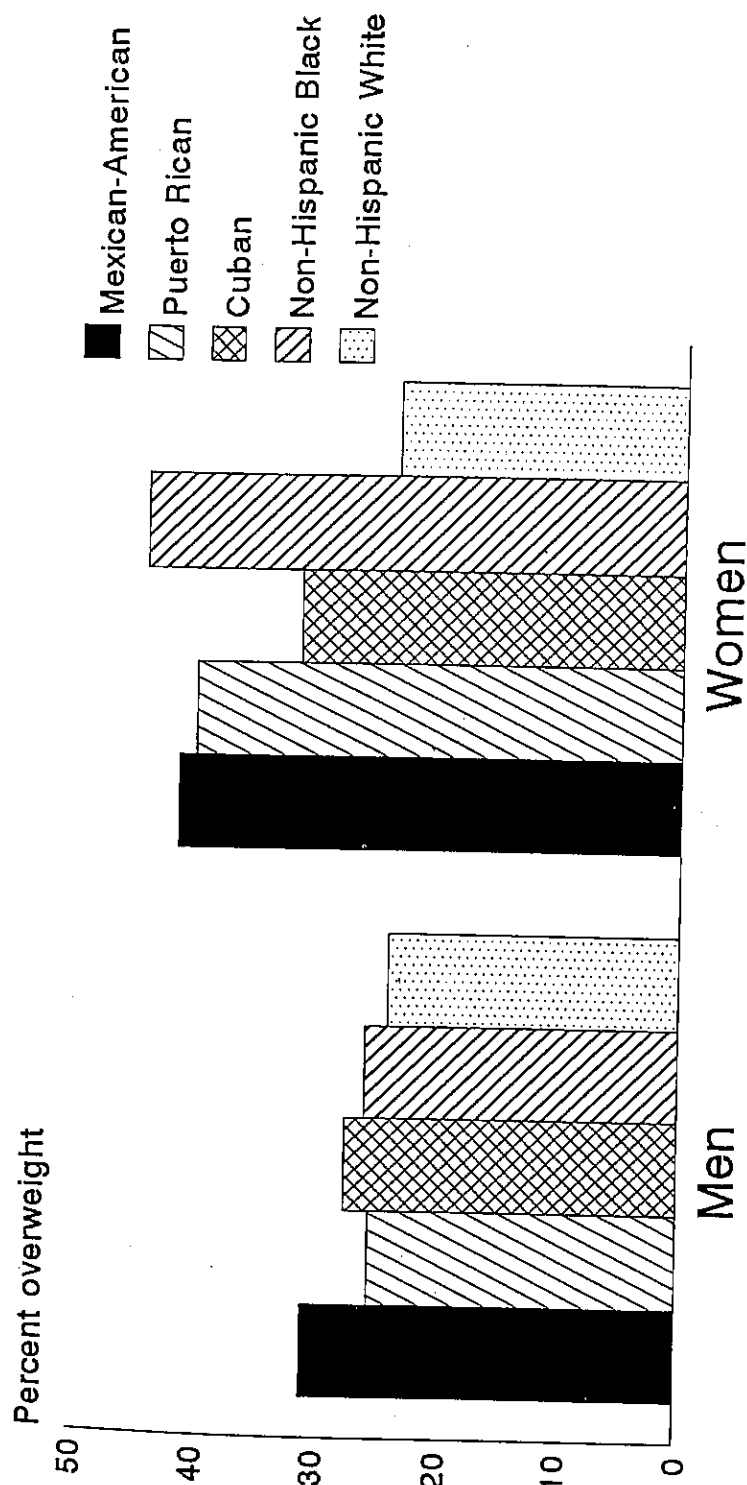


FIGURE 5. Age-adjusted percent of 20- to 74-year-olds who are overweight by race/ethnic origin and sex. Source: National Center for Health Statistics, 1991. \*HHANES (1982-84); \*\* NHANES II (1976-80).

Although rarely discussed, the use of herbs could increase the success of treatment or could even be the main reason why the United States may have a higher English language skills than other countries. Medicines such as "a" and eating utensils, counter or prescription meaning friends or newly arrived immigrants edible plants from the

Until recently, no national longitudinal follow-up study of low birth weight babies. The Interview Survey Study for poor people and

One data set which includes toxic waste sites and the Priority List and the

NCHS recently began the National Water standardized assessment States. NCHS will better regions where water are available; NCHS

Despite the fact that for lower socioeconomic outcome, some studies differentials in health including racism, Clearly, health and environment.

## OTHER CULTURALLY RELATED FACTORS

Although rarely discussed in the environmental health literature, other culturally related factors could increase the susceptibility of a member of a minority group to environmental pollutants or could even be the source of a toxic exposure. First, warning labels for toxic-risk products in the United States may be difficult to understand for people with poor reading ability or poor English language skills. Second, potential sources of toxic exposure include use of traditional medicines such as "azarcon" (a lead-containing treatment for gastrointestinal distress), cooking and eating utensils, cosmetics (e.g., "Surma," a lead-containing eye makeup), and over-the-counter or prescription medications brought to the United States by immigrants or well-meaning friends or relatives (Centers for Disease Control, 1985; Qureshi, 1989). Finally, newly arrived immigrants have tragically mistaken toxic plants in the United States for safe, edible plants from their native country (Wagstaff and Case, 1987).

## WORK IN PROGRESS AND FUTURE DATA

Until recently, no national data on developmental disabilities had been collected. The 1991 Longitudinal Followup to the National Maternal and Infant Health Survey will have data for low birth weight babies with developmental disabilities. The 1993 and 1994 National Health Interview Survey Supplements will have data on disabilities for all ages, although numbers for poor people and minorities may be too small for detailed analyses.

One data set which may be useful in studying the association between residential proximity to toxic waste sites and reproductive outcomes is the linked file of the 1990 EPA National Priority List and the 1988 National Maternal and Infant Health Survey.

NCHS recently began a collaborative project with the U.S. Geological Survey (USGS) called the National Water Quality Assessment Program. The purpose of the program is to develop standardized assessments to measure and monitor surface and groundwater quality in the United States. NCHS will begin to monitor health outcomes (cause specific mortality) for those water regions where water quality data are collected. The Southeast is the first region where data are available; NCHS and USGS met in July 1992 to review geographical coverages and data.

## SUMMARY AND RECOMMENDATIONS

Despite the fact that racial or ethnic disparities have been reduced or eliminated after adjusting for lower socioeconomic status in many studies and using various measures of health outcome, some studies have found persistent racial differences in health effects. Persistent differentials in health after adjustment for socioeconomic status probably have various causes, including racism, cultural differences, and inadequate measures of social strata position. Clearly, health and illness are produced within a broad social context that includes the physical environment.

Women  
Men  
0

FIGURE 5. Age-adjusted percent of 20- to 74-year-olds who are overweight by race/ethnic origin and sex. Source: National Center for Health Statistics, 1991. \*HHANES (1982-84); \*\* NHANES II (1976-80).

Since childhood social class and its related health status precedes adult social class and health status, social class during childhood (the heretofore unknown or ignored variable) also needs to be entered into our research. Measures of childhood social class are at least as important as current social class in understanding the etiology of disease and illness, and in addressing inequity in environmental health. For certain diseases, even those that occur in adulthood, childhood environment may be even more important than adult environment.

Multiple social class indicators should be used because social class has several dimensions, some of which are related to wealth, while others are related to political power and social status. The empirical evidence tells us that single indicators such as race, education, income, and occupation capture different dimensions of a person's position in the social strata. Therefore the use of only one of these indicators underestimates the relationship between health and social class. The pitfalls of using highly correlated variables together in an analysis can be avoided through the use of multivariable statistical methods that recognize the existence of multicollinearity (Kiely, 1991). Composite indexes (or weighted sums) should probably be avoided since they obscure relationships between component indicators and particular health outcomes.

Although income is a better proxy of economic well-being than education and occupation, we need other ancillary measures which are more direct and precise than these indirect, traditional measures of socioeconomic status. Knowledge of specific components of living conditions in both childhood and adulthood can be used to develop more precise indicators of economic well-being. Recent work, which moves beyond the traditional indicators, suggests that new indicators such as owning a car or a home may be more sensitive to social influences on health (Goldblatt, 1990). Whenever possible, initial multivariable analysis should use continuous instead of categorical income data since disadvantaged minorities tend to be lumped together at the lower end of a given category (Liberatos et al., 1988).

Public health research should also consider the role of social structures and living conditions in producing risk behaviors (Becker, 1993). For example, improper diet and lack of preventive medical tests are elements in Williams' "patterned response" to "the realities and constraints of the external environment" (Williams, 1990). Although this paper did not review studies of racial or ethnic differences in health that examine the effects of racism, investigators are encouraged to consider psychophysiological reactions to racial/ethnic discrimination and ethnic group differences in coping mechanisms, social supports, and physical environments (David and Collins, 1991). In addition, there are certain health conditions for which the modal chain of events, resulting in onset, differs markedly between race/ethnic origin groups (e.g., HIV infection) (Osborne and Feit, 1992).

We encourage additional multivariate analyses of existing social class data from national surveys. We also encourage the linking of files or data sets where appropriate. We also need to improve ways to incorporate contextual variables such as family, neighborhood, and

community into our research in order to understand individual characteristics in order to lead to a better environment to produce

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- AGENCY FOR TOXIC SUBSTANCE ABUSE, "Poisoning in Child Human Services, V AMERICAN CANCER SOCIETY, Subcommittee on Cancer Stratification, N. (1992). stratification." Ger ANNEST, J.L. and MA United States, 197 MD. BANE, M.J. and ELLV Science 245: 104 BANG, K.M., GERGE, U.S. Hispanics from Pub. Hlth. 80 (12 BAQUET, C.R., HORI and cancer incidence BASSETT, M.T. and K survival." Am. J. BAUMEISTER, A., DO Guide for State 1 Associated with President's Comm BECERRA, J.E., HOG Hispanics: A portrait BECKER, M.H. (1993: 34: 1-6. BEEGHLY, L. (1984). 333. BELLINGER, D.C., S and academic achievement BIANCHI, S.M. and S Women in Transition BLAXTER, M. (1985 Social Affairs 10: BLAXTER, M. (1987 30-33.

community into our research. We need better contextual analyses so that we can distinguish individual characteristics from contextual effects. And finally, we need more interdisciplinary research in order to learn from each other how the social context interacts with the physical environment to produce human health and disease.

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### REFERENCES

- AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY. (1988). *The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress*. Department of Health and Human Services, Washington, DC.
- AMERICAN CANCER SOCIETY. (1986). *Cancer in the Economically Disadvantaged: A Special Report*. Subcommittee on Cancer in the Economically Disadvantaged, New York, NY.
- ANDES, N. (1992). "Social class and gender: An empirical evaluation of occupational stratification." *Gender and Society* 6(2): 231-251.
- ANNEST, J.L. and MAHAFFEY, K. (1984). Blood lead levels for persons ages 6 months-74 years, United States, 1976-80. Series 11, No. 233. National Center for Health Statistics, Hyattsville, MD.
- BANE, M.J. and ELLWOOD, D.T. (1989). "One fifth of the nation's children: Why are they poor?" *Science* 245: 1047-1053.
- BANG, K.M., GERGEN, P.J., and CARROLL, M. (1990). "Prevalence of chronic bronchitis among U.S. Hispanics from the Hispanic Health and Nutrition Examination Survey, 1982-84." *Am. J. Pub. Hlth.* 80 (12): 1495-1497.
- BAQUET, C.R., HORM, J.W., GIBBS, T., and GREENWALD, P. (1991). "Socioeconomic factors and cancer incidence among blacks and whites." *J. Natl. Cancer Inst.* 83(8): 551-556.
- BASSETT, M.T. and KRIEGER, N. (1986). "Social class and black-white differences in breast cancer survival." *Am. J. Pub. Hlth.* 76(12): 1400-1435.
- BAUMEISTER, A., DOKECKI, P.R., and KUPSTAS, F.D. (1988). *Preventing the New Morbidity: A Guide for State Planning for the Prevention of Mental Retardation and Related Disabilities Associated with Socioeconomic Conditions*. Office of Human Development Services, President's Committee on Mental Retardation, Washington, DC.
- BECERRA, J.E., HOGUE, C.J.R., ATRASH, H.K., and PEREZ, N. (1991). "Infant mortality among Hispanics: A portrait of heterogeneity." *J. Amer. Med. Assoc.* 265: 217-221.
- BECKER, M.H. (1993). "A medical sociologist looks at health promotion." *J. Hlth. Social Beh.* 34: 1-6.
- BEEGHLY, L. (1984). "Illusion and reality in the measurement of poverty." *Soc. Problems* 31: 322-333.
- BELLINGER, D.C., STILES, K.M., and NEEDLEMAN, H.L. "Low-level lead exposure, intelligence and academic achievement: A long-term follow-up study." *Pediatrics* 90(6): 855-861.
- BIANCHI, S.M. and SPAIN, D. (1986). "Income, poverty, and per capita well-being." In: *American Women in Transition*. Russell Sage Foundation, New York, NY.
- BLAXTER, M. (1985). "Self-definition of health status and consulting rates in primary care." *Q. J. Social Affairs* 1(2): 131-171.
- BLAXTER, M. (1987). "Evidence on inequality in health from a national survey." *Lancet* 2(8549): 30-33.

- BRANCATI, F.L., WHITTLE, J.C., WHELTON, P.K., SEIDLER, A.J., and KLAG, M.J. (1992). "The excess incidence of diabetic end-stage renal disease among blacks: A population-based study of potential explanatory factors." *J. Amer. Med. Assoc.* 268(21): 3079-3084.
- BUREAU OF THE CENSUS. (1988). *We, The Asian and Pacific Islander Americans*. Dept. of Commerce, Washington, DC.
- BUREAU OF THE CENSUS. (1991a). *Money Income of Households, Families and Persons in the U.S.: 1990*. Current Population Reports. Dept. of Commerce, Washington, DC, P-60, No. 174.
- BUREAU OF THE CENSUS. (1991b). *Poverty in the U.S. 1990*. Current Population Reports. Dept. of Commerce, Washington, DC, P-60 No. 175.
- BUREAU OF THE CENSUS. (1991c). *United States Department of Commerce News: Census Bureau Releases 1990 Census Counts on Specific Racial Groups*. Dept. of Commerce, Washington, DC, CB91-215.
- BUREAU OF THE CENSUS. (1992a). *Educational attainment in the United States: March 1991 and 1990*. Current Population Reports, Population Characteristics. Dept. of Commerce, Washington, DC, P-20, No. 462.
- BUREAU OF THE CENSUS. (1992b). *The Asian and Pacific Islander Population in the United States: March 1991 and 1990*. Current Population Reports. Dept. of Commerce, Washington, DC, P-20 No. 459.
- CALABRESE, E.J. (1980). *Nutrition and Environmental Health: Vol. 1. The Vitamins*. John Wiley and Sons, New York, NY.
- CALABRESE, E.J. (1984). *Ecogenetics: Genetic Variations in Susceptibility to Environmental Agents*. Wiley-Interscience Publication, John Wiley and Sons, New York, NY.
- CARTER-POKRAS, O. and GERGEN, P. (1993). "Reported asthma among Puerto Rican, Mexican-American, and Cuban children: HHANES, 1982-84." *Am. J. Pub. Hlth.* 83(4): 580-582.
- CARTER-POKRAS, O., PIRKLE, J., CHAVEZ, G., and GUNTER, E. (1990). "Blood lead levels of 4-11 year old Mexican American, Puerto Rican, and Cuban children." *Pub. Hlth. Reports* 105(4): 388-393.
- CENTERS FOR DISEASE CONTROL. (1985). *Preventing Lead Poisoning in Young Children*. Atlanta, GA.
- CENTERS FOR DISEASE CONTROL. (1988). *Congenital Malformations Surveillance: January 1983 - December 1985*. Atlanta, GA.
- CHILDREN'S DEFENSE FUND. (1991). *The State of America's Children*. Washington, DC.
- COMMISSION FOR RACIAL JUSTICE. (1987). *Toxic Wastes and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites*. United Church of Christ, NY.
- COOPER, R. and DAVID, R. (1986). "The biological concept of race and its application to public health and epidemiology." *J. Hlth. Politics, Policy and Law* 11(1): 97-116.
- DAHL, E. (1991). "Inequality in health and the class position of women - The Norwegian experience." *Soc. Hlth. and Illness* 13(4): 492-505.
- DAVID, R.J. and COLLINS, J.W. (1991). "Bad outcomes in black babies: Race or racism?" *Ethnicity Dis.* 1: 236-244.
- DUTTON, D. (1981). "Children's health care: The myth of equal access." In: *Better Health for Our Children*, Vol. IV. Office of the Assistant Secretary for Health and Surgeon General's Office, Washington, DC, Pub. No. (PHS) 79-55071.
- EGGEBEEN, D.J. and LICHTER, D.T. (1991). "Race, family structure, and changing poverty among American children." *Am. Soc. Review* 56: 801-817.
- EMANUEL, I., HALE, C.B., and BERG, C.J. (1989). "Poor birth outcomes of American black women: An alternative explanation." *J. Pub. Hlth. Policy* 10(3): 299-308.
- FARFEL, M.R. (1985). "Reducing lead exposure in children." *Annual Rev. Pub. Hlth.* 6: 333-360.
- FARLEY, R. and ALLEN, W. (1987). *The Color Line and the Quality of Life in America*. Russell Sage Foundation, New York, NY.
- FELDMAN, J.J., MAKUC, D.M., KLEINMAN, J.C., and CORNONI-HUNTLEY, J. (1989). "National trends in educational differentials in mortality." *Am. J. Epidemiol.* 129(5): 919-933.
- FINGERHUT, L.A. and MAKUC, D.M. (1992). "Mortality among minority populations in the United States." *Am. J. Pub. Hlth.* 82(8): 1168-1170.

FRISANCHO, A.R. and 1  
concentrations in M  
GARDNER, R.W., ROB  
diversity." *Populatio*  
GERGEN, P.J., EZZATI  
WHITNER, J. (198  
HHANES, Southwe  
Association annual  
GERGEN, P.J., MULLA  
among children in t  
GESCHWIND, S.A., STC  
and MELIUS, J. (   
hazardous waste sit  
GILLUM, R.F. (1991).  
function norms and  
GOLD, M.R. and FRAN  
a rural community.  
GOLDBLATT, P. (ed.).  
Population Census :  
GOLDETHORPE, J. (1  
Sociology 17: 465  
GRELLA, C.E. (1990)  
downward mobility  
HAAN, M.N. and KAP  
health." In: *Crosso*  
Force on Black and  
HAHN, R.A. (1992). "  
Med. Assoc. 267(  
HAHN, R.A., MULINA  
ethnicity between  
through 1985." *J.*  
HAUG, M.R. (1973). "  
52: 86-98.  
HARLAN, W.R., LAN  
(1985). "Blood l  
population." *J. An*  
HOLLINGSHEAD, A.J  
Study. John Wiley  
HOY, W.E., MEGILL  
etiology in the Zu  
HOY, W.E., SMITH, S  
glomerulonephriti  
HU, H. (1991). "Know  
plumbism." *Am. J.*  
INDIAN HEALTH SERVI  
U.S. Government  
JONES, D.Y., NESHE  
with poverty in t  
national surveys." *J.*  
KAPLAN, G.A. and S  
heart disease duri  
KASISKE, B.L., NEYI  
S.R., and WHITE  
N. Engl. J. Med.



L.J. (1992). "The  
a-based study of  
t. of Commerce,  
sons in the U.S.:  
, No. 174.  
Reports. Dept. of  
Census Bureau  
rce, Washington,  
March 1991 and  
of Commerce,  
the United States:  
ashington, DC, P-  
amins. John Wiley  
to Environmental  
Y.  
to Rican, Mexican-  
od lead levels of 4 -  
th. Reports 105(4):  
Children. Atlanta,  
ce: January 1983 -  
n, DC.  
d States: A National  
ith Hazardous Waste  
application to public  
5.  
n - The Norwegian  
s: Race or racism?"  
Better Health for Our  
geon General's Office,  
anging poverty among  
es of American black  
8.  
ub. Hlth. 6: 333-360.  
ife in America. Russell  
EY, J. (1989). "National  
(5): 919-933.  
rity populations in the

- FRISANCHO, A.R. and RYAN, A.S. (1991). "Decreased stature associated with moderate blood lead concentrations in Mexican-American children." *Am. J. Clin. Nutr.* 54: 516-519.
- GARDNER, R.W., ROBEY, B., and SMITH, P.C. (1985). "Asian-American growth, change and diversity." *Population Bulletin* 40(4). pp. 3-43.
- GERGEN, P.J., EZZATI, T., ROWLAND, M., BRUNNELLE, J., ELKINS, E., ISMAIL, A., and WHITNER, J. (1985). "Indicators of need for health care among Mexican-American children: HHANES, Southwest United States, 1982-84." Presented at the American Public Health Association annual meetings, Washington, D.C. November 20.
- GERGEN, P.J., MULLALY, D.I., and EVANS, R. (1988). "National survey of prevalence of asthma among children in the United States, 1976 to 1980." *Pediatrics* 81: 1-7.
- GESCHWIND, S.A., STOLWIJK, J.A.J., BRACKEN, M., FITZGERALD, E., STARK, A., OLSEN, C., and MELIUS, J. (1992). "Risk of congenital malformations associated with proximity to hazardous waste sites." *Am. J. Epidemiol.* 135(11): 1197-1207.
- GILLUM, R.F. (1991). "Chronic obstructive pulmonary disease in blacks and whites: Pulmonary function norms and risk factors." *J. Natl. Med. Assoc.* 83: 393-401.
- GOLD, M.R. and FRANKS, P. (1990). "The social origin of cardiovascular risk: An investigation in a rural community." *Int. J. Health Services* 20(3): 405-416.
- GOLDBLATT, P. (ed.). (1990). *Longitudinal Study: Mortality and Social Organisation*. Office of Population Census and Surveys, HMSO, London.
- GOLDTHORPE, J. (1983). "Women and class analysis: In defense of the conventional view." *Sociology* 17: 465-488.
- GRELLA, C.E. (1990). "Irreconcilable differences: Women defining class after divorce and downward mobility." *Gender and Society* 4(1): 41-55.
- HAAN, M.N. and KAPLAN, G.A. (1985). "The contribution of socioeconomic position to minority health." In: *Crosscutting Issues in Minority Health* (Vol. II), Report of the Secretary's Task Force on Black and Minority Health. DHHS, Washington, DC. pp. 69-103.
- HAHN, R.A. (1992). "The state of federal health statistics on racial and ethnic groups." *J. Amer. Med. Assoc.* 267(2): 268-271.
- HAHN, R.A., MULINARE, J., and TEUTSCH, S.M. (1992). "Inconsistencies in coding of race and ethnicity between birth and death in U.S. infants: A new look at infant mortality, 1983 through 1985." *J. Amer. Med. Assoc.* 267: 259-263.
- HAUG, M.R. (1973). "Social class measurement and women's occupational roles." *Social Forces* 52: 86-98.
- HARLAN, W.R., LANDIS, J.R., SCHMONDER, R.L., GOLDSTEIN, N.G., and HARLAN, L.C. (1985). "Blood lead and blood pressure: Relationship in the adolescent and adult U.S. population." *J. Amer. Med. Assoc.* 253: 530-534.
- HOLLINGSHEAD, A.B. and REDLICH, F.C. (1958). *Social Class and Mental Illness: A Community Study*. John Wiley and Sons, New York, NY.
- HOY, W.E., MEGILL, D.M., and HUGHSON, M.D. (1987). "Epidemic renal disease of unknown etiology in the Zuni Indians." *Am. J. Kidney Dis.* 9: 485-496.
- HOY, W.E., SMITH, S.M., HUGHSON, M.D., and MEGILL, D.M. (1989). "Mesangial proliferative glomerulonephritis in southwestern American Indians." *Transplant Proc.* 21: 3909-3912.
- HU, H. (1991). "Knowledge of diagnosis and reproductive history among survivors of childhood plumbism." *Am. J. Public Health* 81(8): 1070-1072.
- INDIAN HEALTH SERVICE. (1992). *Trends in Indian Health 1992*. DHHS Pub. No. 300-165/50070. U.S. Government Printing Office, Rockville, MD.
- JONES, D.Y., NESHEIM, M.C., and HABICHT, J.P. (1985). "Influences in child growth associated with poverty in the 1970s: an examination of HANES I and HANES II, cross-sectional U.S. national surveys." *Am. J. Clin. Nutr.* 42: 714-724.
- KAPLAN, G.A. and SALONEN, J.T. (1990). "Socioeconomic conditions in childhood and ischaemic heart disease during middle age." *Br. Med. J.* 301: 1121-1123.
- KASISKE, B.L., NEYLAN, J.F., REGGIO, R.R., DANOVITCH, G.M., KAHANA, L., ALEXANDER, S.R., and WHITE, M.G. (1991). "The effect of race on access and outcome in transplantation." *N. Engl. J. Med.* 324(5): 302-307.

- KEIL, J.E., SUTHERLAND, S.E., KNAPP, R.G., and TYROLER, H.A. (1992). "Does equal socioeconomic status in black and white men mean equal risk of mortality?" *Am. J. Pub. Hlth.* 82(8): 1133-1136.
- KIELY, J.L. (1991). "Some conceptual problems in multivariable analyses of perinatal mortality." *Paediatric Perinatal Epidemiol.* 5: 243-257.
- KIELY, M. (ed.). (1991). *Reproductive and Perinatal Epidemiology*. CRC Press, Boca Raton, FL.
- KITAGAWA, E.M. and HAUSER, P.M. (1973). *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology*. Harvard Univ. Press, Cambridge, MA.
- KLEINMAN, J.C., FINGERHUT, L.A., and PRAGER, K. (1991). "Differences in infant mortality by race, nativity status, and other maternal characteristics." *Am. J. Dis. Child.* 145: 194-199.
- KLEINMAN, J.C. (1990). "Infant mortality among racial/ethnic minority groups, 1983-84." *MMWR* 39: 31-39.
- KRIEGER, N. (1987). "Shades of difference: Theoretical underpinnings of the medical controversy on black/white differences in the United States, 1830-1870." *Int. J. Health Services* 17: 256-278.
- KRIEGER, N. (1991). "Women and social class: A methodological study comparing individual, household, and Census measures as predictors of black/white differences in reproductive history." *J. Epidemiol. Community Hlth.* 45: 35-42.
- KRIEGER, N. (1992). "The making of public health data: Paradigms, politics, and policy." *J. Pub. Hlth. Policy* 13: 412-427.
- KRIEGER, N., ROWLEY, D., HERMAN, A.A., AVERY, B., and PHILLIPS, M.T. (1993). "Racism, sexism, and social class: Implications for studies of health, disease, and well-being." *Am. J. Prev. Med.* (In press).
- LERNER, M. (1986). "Cancer mortality differentials by income." In: *Cancer in the Economically Disadvantaged*, American Cancer Society, New York, NY.
- LEVY, F. and MURNANE, R.J. (1992). "U.S. earnings levels and earnings inequality: A review of recent trends and proposed explanations." *J. Econ. Lit.* Sept. 30(3): 1333-1381.
- LIBERATOS, P., LINK, B.G., and KELSEY, J.L. (1988). "The measurement of social class in epidemiology." *Epidemiol. Rev.* 10: 87-121.
- LIFE SCIENCES RESEARCH OFFICE, FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY. (1989). *Nutrition Monitoring in the United States—An Update Report on Nutrition Monitoring*. DHHS Pub. No. (PHS) 89-1255. Public Health Service, Washington, DC.
- LINDER, F.E. and GROVE, R.D. (1943). "Vital statistics rates in the United States, 1900-1940. Washington, D.C. (1943)." Cited in Terris, M. (1973). "Desegregating health statistics." *Am. J. Pub. Hlth.* 63(6): 477-480.
- LIN-FU, J.S. (1992). "Modern history of lead poisoning: A century of discovery and rediscovery." In: *Human Lead Exposure* (H.L. Needleman, ed.). CRC Press, Inc., Boca Raton, FL. pp. 23-43.
- LOOKER, A.C., JOHNSON, C.L., McDOWELL, M.A., and YETLEY, E.A. (1989). "Iron status: Prevalence of impairment in three Hispanic groups in the United States." *Am. J. Clin. Nutr.* 49: 553-558.
- LOOKER, A.C., JOHNSON, C.L., WOTEKI, C.E., YETLEY, E.A., and UNDERWOOD, B.A. (1988). "Ethnic and racial differences in serum vitamin A levels of children aged 4-11 years." *Am. J. Clin. Nutr.* 47: 247-252.
- MARMOT, M.G., KOGEVINAS, M., and ELSTON, M.A. (1987). "Social/economic status and disease." *Annual Rev. Public Health* 8: 111-135.
- MAURER, J.D., ROSENBERG, H.M., and KEEMER, J.B. (1990). "Deaths of Hispanic origin: 15 reporting states, 1979-81." *National Center for Health Statistics. Vital Health Stat.* 20(18).
- MCCARTHY, P., BYRNE, D., HARRISSON, S., and KEITHLEY, J. (1985). "Respiratory conditions: Effect of housing and other factors." *J. Epidemiol. Community Health* 39: 15-19.
- McLANAHAN, S.S., SORENSEN, A., and WATSON, D. (1989). "Sex differences in poverty, 1950-1980." *Signs J. Women in Culture and Society* 15(1): 102-122.
- McWHORTER, W.P., POLIS, M.A., and KASLOW, R.A. (1989). "Occurrence, predictors and consequences of adult asthma in NHANES I and Followup Survey." *Am. Rev. Respir. Dis.* 139: 721-724.

MEDICAL RESEARCH CO  
defects: Results of  
MEGILL, D.M. and H  
community." *Tran.*  
MONTGOMERY, L.E.  
Young People Sin  
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NEEDLEMAN, H.L. a  
meta-analysis of  
NEEDLEMAN, H.L.,  
long-term effects  
Engl. J. Med. 32  
NELSON, M.D. (1992  
Public Health. 8  
NELSON, R.G. and E  
Proc. 21: 3913-3  
NEWACHECK, P.W.  
(1980). "Income  
NEWACHECK, P.W.  
chronic condition  
NEWACHECK, P.W.  
chronic condition  
71.  
NEWACHECK, P.W.  
among poor and  
NEWMAN, J.M., MA  
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O'HARE, W.P. (1985  
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America: Where  
Priorities and Fa  
OSBORNE, N.G., ar  
Amer. Med. As

- MEDICAL RESEARCH COUNCIL VITAMIN STUDY RESEARCH GROUP. (1991). "Prevention of neural tube defects: Results of the Medical Research Council Vitamin Study." *Lancet* 338(8760): 131-137.
- MEGILL, D.M. and HOY, W.E. (1989). "Risk factors for renal disease in a Native American community." *Transplant Proc.* 21: 3902-3905.
- MONTGOMERY, L.E. (1992). "Increased Effects of Poverty on the Health of U.S. Children and Young People Since 1976." Presented at the American Public Health Association Annual Meeting, Washington, DC. November 9.
- NATIONAL CANCER INSTITUTE. (1991). Report of the Special Action Committee 1991: Program Initiatives Related to Minorities, the Underserved, and Persons Aged 65 and Over. National Institutes of Health, Bethesda, MD.
- NATIONAL CENTER FOR HEALTH STATISTICS. (1991a). Health United States, 1990. Public Health Service, Hyattsville, MD.
- NATIONAL CENTER FOR HEALTH STATISTICS. (1991b). Vital Statistics of the United States, 1988, Vol. II, Mortality, Part A. Public Health Service, Washington, DC.
- NATIONAL CENTER FOR HEALTH STATISTICS. (1993a). Health United States, 1992. Public Health Service, Hyattsville, MD.
- NATIONAL CENTER FOR HEALTH STATISTICS. (1993b). Advance report of final mortality statistics, 1991. Monthly Vital Statistics Report; Vol. 42, no. 2, supp. Public Health Service, Hyattsville, MD.
- NATIONAL CENTER FOR HEALTH STATISTICS. (1993c). Advance report of final natality statistics, 1991. Monthly Vital Statistics Report; Vol. 42, No. 3, supp. Public Health Service, Hyattsville, MD.
- NATIONAL CENTER FOR HEALTH STATISTICS. (1993). Vital Statistics of the United States, 1989, Vol. I, Natality. Public Health Service, Washington, DC. (In press).
- NEEDLEMAN, H.L. and GATSONIS, E.A. (1990). "Low-level lead exposure and the IQ of children. A meta-analysis of modern studies." *J. Amer. Med. Assoc.* 263(5): 673-678.
- NEEDLEMAN, H.L., SCHELL, A., BELLINGER, D., LEVITON, A. and ALLRED, E.N. (1990). "The long-term effects of exposure to low doses of lead in children: An 11-year follow-up report." *N. Engl. J. Med.* 322(2): 83-88.
- NELSON, M.D. (1992). "Socioeconomic status and childhood mortality in North Carolina." *Am. J. Public Health.* 82(8): 1131-1133.
- NELSON, R.G. and BENNETT, P.H. (1989). "Diabetic renal disease in Pima Indians." *Transplant Proc.* 21: 3913-3915.
- NEWACHECK, P.W., BUTLER, L.H., HARPER, A.K., PIONTKOWSKI, A.B., and FRANKS, P.E. (1980). "Income and illness." *Med. Care* 18: 1165-1176.
- NEWACHECK, P.W., BUDETTI, P.P., and HALFON, N. (1986a). "Trends in activity-limiting chronic conditions among children." *Am. J. Pub. Health* 76(2): 178-184.
- NEWACHECK, P.W., HALFON, N., and BUDETTI, P.P. (1986b). "Prevalence of activity-limiting chronic conditions among children based on household interviews." *J. Chronic Dis.* 39(2): 63-71.
- NEWACHECK, P.W. and STARFIELD, B. (1988). "Morbidity and use of ambulatory care services among poor and nonpoor children." *Am. J. Public Health* 78(8): 927-933.
- NEWMAN, J.M., MARFIN, A.A., EGGERS, P.W., and HELGERSON, S.D. (1990). "End stage renal disease among Native Americans, 1983-86." *Am. J. Public Health* 80: 318-319.
- OFFICE OF TECHNOLOGY ASSESSMENT, CONGRESS OF THE UNITED STATES. (1991). Adolescent Health: Summary and Policy Options, Vol I. OTA-H-468, Washington, DC.
- OFFICE OF THE ASSISTANT SECRETARY FOR HEALTH AND SURGEON GENERAL. (1981). Better Health for Our Children: A National Strategy, The Report of the Select Panel for the Promotion of Child Health to the United States Congress and the Secretary of Health and Human Services, Washington, DC.
- O'HARE, W.P. (1985). "Poverty in America: Trends and New Patterns." *Pop. Bulletin* 40(3): 1-43.
- O'HARE, W.P., MANN, T., PORTER, K., and GREENSTEIN, R. (1990). Real Life Poverty in America: Where the American Public Would Set the Poverty Line. Center on Budget and Policy Priorities and Families USA Foundation. Washington, DC.
- OSBORNE, N.G., and FEIT, M.D. (1992). "The use of race in medical research, Commentary." *J. Amer. Med. Assoc.* 267(2): 275-279.

- OSTFELD, A.M. and EAKER, E.D. (eds.). (1985). *Measuring Psychosocial Variables in Epidemiologic Studies of Cardiovascular Disease: Proceedings of a Workshop*. National Institutes of Health, Bethesda, MD.
- PALMER, J.J., SMEEDING, T., and TORREY, B.B. (eds.). (1988). *The Vulnerable. The Urban*. Institute Press, Washington, D.C.
- PAPPAS, G., QUEEN, S., HADDEN, W., and FISHER, G. (1993). "The widening health gap: Increasing differential mortality in the U.S., 1960-86." *N. Engl. J. Med.* (In press).
- PARKER, J.D., KIELY, J.L., and SCHOENDORF, K.C. (1992). "Poverty, Occupational Status and Small-for-Gestation Age Infants in the United States." Presented to the Society for Pediatric Epidemiologic Research, Minneapolis, MN.
- PIRKLE, J.L., SCHWARTZ, J., LANDIS, J.R., and HARLAN, W.R. (1985). "The relationship between blood lead levels and blood pressure and its cardiovascular risk implications." *Am. J. Epidemiol.* 121: 246-258.
- PUBLIC HEALTH SERVICE. (1992). *Improving Minority Health Statistics: Report of the Public Health Service Task Force on Minority Health Data*. Office of Minority Health, Rockville, MD.
- PUGH, J.A., STERN, M.P., HAFFNER, S.M., EIFLER, C.W., and ZAPATA, M. (1988). "Excess incidence of treatment of end-stage renal disease in Mexican Americans." *Am. J. Epidemiol.* 127: 135-144.
- QURESHI, B. (1989). *Transcultural Medicine Dealing with Patients from Different Cultures*. Kluwer Academic Publishers, London, England.
- RIES, P.W. (1985). *Health Characteristics According to Family and Personal Income, United States. Series 10, No. 147*. National Center for Health Statistics, Hyattsville, MD.
- RIES, P.W. (1990). *Health of Black and White Americans, 1985-87. Series 10, No. 171*. National Center for Health Statistics, Hyattsville, MD.
- ROGERS, R.G. (1992). "Living and dying in the USA: Sociodemographic determinants of death among blacks and whites." *Demography* 29(2): 287-303.
- ROSENBERG, M. (1968). *The Logic of Survey Analysis*. Basic Books, New York, NY.
- RYAN, A.S., MARTINEZ, G.A., and ROCHE, A.F. (1990). "An evaluation of the associations between socioeconomic status and the growth of Mexican-American children: Data from the Hispanic Health and Nutrition Examination Survey (HHANES 1982-1984)." *Am. J. Clin. Nutr.* 51: 944S-952S.
- SCHOENDORF, K.C., HOGUE, C.J.R., KLEINMAN, J.C., and ROWLEY, D. (1992). "Mortality among infants of black as compared with white college-educated parents." *N. Engl. J. Med.* 326: 1522-1526.
- SCHWARTZ, J., ANGLE, C., and PITCHER, H. (1986). "Relationship between childhood blood lead levels and stature." *Pediatrics* 77(3): 281-288.
- SCHWARTZ, J. and OTTO, D. (1987). "Blood lead, hearing thresholds, and neurobehavioral development in children and youth." *Arch. Envir. Hlth.* 42(2): 153-160.
- SCHWARZ, J.E. and VOLGY, T.J. (1992). *The Forgotten Americans*. W.W. Norton, New York, NY.
- SCIARILLO, W.G., ALEXANDER, G., and FARRELL, K.P. (1992). "Lead exposure and child behavior." *Am. J. Pub. Hlth.* 82(10): 1356-1360.
- SMITH, D.S. and EGGER, M. (1992). "Socioeconomic differences in mortality in Britain and the United States." *Am. J. Public Health* 82(8): 1079-1081.
- SMITH, S.M. and TUNG, K.S. (1985). "Incidence of IgA-related nephritides in American Indians in New Mexico." *Hum. Pathol.* 16: 181-4.
- SOREL, J.E., RAGLAND, D.R., SYME, S.L., and DAVIS, W.B. (1992). "Educational status and blood pressure: The second National Health and Nutrition Examination Survey, 1976-1980, and the Hispanic Health and Nutrition Examination Survey, 1982-84." *Am. J. Epidemiol.* 135: 1339-1348.
- SOREL, J.E., HEISS, G., TYROLER, H.A., DAVIS, W.B., WING, S.B., and RAGLAND, D.R. (1991). "Black-white differences in blood pressure among participants in NHANES II: The contribution of blood lead." *Epidemiol.* 2: 348-352.
- STANWORTH, M. (1984). "Women and class analysis: A reply to John Goldthorpe." *Sociology* 18: 159-170.
- STARFIELD, B., SHA "Race, family inc
- STARFIELD, B. (198 Health Policy 3(
- TEACHMAN, J.D. (1 United States: Sc
- TEUTSCH, S., NEW United States: A
- TIELSCH, J.M., SOM Survey Researc
- TIELSCH, J.M., SOM Americans." *Arc*
- VALANIS, B.M. (19 to birth weight
- VALANIS, B.M. and Social Biology
- VALANIS, B.M. and foreign-born wo
- VOBEJDA, B. (1992 p. A3.
- WADSWORTH, M.J achievement." *I*
- WADSWORTH, M.J Tavistock, Lond
- WAGSTAFF, D.J. ar 361-367.
- WAITZKIN, H. (198 11: 77-103.
- WEISS, K.B., GERG an emerging U.S
- WEISSMAN, A. (19 Health Reports
- WEITZMAN, M., G risks for childho
- WIECHA, J.L. and nutrition and fo
- WIECHA, J.L. and Am. J. Pub. Hlt
- WILKINSON, R.G. ( 82(8): 1082-10
- WILKINSON, R.G. ( 1921-1981." *J*
- WILKINSON, R.G. London, Englan
- WILLIAMS, D. (19 Psych. Q. 53(2)
- WILLIAMS, D. (19 Health Services
- WILLIAMS, D. (19 Medical College
- WILSON, W.J. (1 Washington, DC
- WINKLEBY, M.A., status and heal
- WINKLEBY, M.A., cardiovascular d
- WISE, P.H. and PU 326(23): 1558-
- YU, E.S.H., CHANC there excess de
- YU, E.S.H., CHANC Task Force on I

- STARFIELD, B., SHAPIRO, S., WEISS, J., LIANG, K.Y., RA, K., PAIGE, D., and WANG, X. (1991). "Race, family income, and low birth weight." *Am. J. Epidemiol.* 134(10): 1167-1174.
- STARFIELD, B. (1982). "Family income, ill health, and medical care of U.S. children." *J. Public Health Policy* 3(3): 244-259.
- TEACHMAN, J.D. (1990). "Socioeconomic resources of parents and award of child support in the United States: Some exploratory models." *J. Marriage and the Family* 52: 689-699.
- TEUTSCH, S., NEWMAN, J., and EGGERS, P. (1989). "The problem of diabetic renal failure in the United States: An overview." *Am. J. Kidney Dis.* 13: 11-13.
- TIELSCH, J.M., SOMMER, A., KATZ, J., QUIGLEY, H., and EZRINE, S. (1991). "Baltimore Eye Survey Research Group: Socioeconomic status and visual impairment among urban Americans." *Arch. Ophthalmol.* 109: 637-641.
- VALANIS, B.M. (1979). "Relative contributions of maternal social and biological characteristics to birth weight and gestation among mothers of different childhood socioeconomic status." *Social Biology* 26(3): 211-225.
- VALANIS, B.M. and RUSH, D. (1979). "A partial explanation of superior birth weights among foreign-born women." *Social Biology* 26(3): 198-210.
- VOBEJDA, B. (1992). "Child poverty rate rose during prosperous '80s." *Washington Post*. July 8, p. A3.
- WADSWORTH, M.E.J. (1986). "Serious illness in childhood and its association with later-life achievement." In: *Class and Health: Research and Longitudinal Data* (R.G. Wilkinson, ed.). Tavistock, London, England. pp. 51-74.
- WAGSTAFF, D.J. and CASE, A.A. (1987). "Human poisoning by Zigadenus." *Clin. Toxicol.* 25: 361-367.
- WAITZKIN, H. (1981). "The social origins of illness: A neglected history." *Intl. J. Health Services* 11: 77-103.
- WEISS, K.B., GERGEN, P.J., and CRAIN, E.F. (1992). "Inner-city asthma—The epidemiology of an emerging U.S. public health concern." *Chest* 101(6): 362S-367S.
- WEISSMAN, A. (1990). "Race-ethnicity: A dubious scientific concept, Letters to the editor." *Public Health Reports* 105(1): 102-103.
- WEITZMAN, M., GORTMAKER, S., and SOBOL, A. (1990). "Racial, social and environmental risks for childhood asthma." *Am. J. Dis. Child.* 144: 1189-1194.
- WIECHA, J.L. and PALOMBO, R. (1989). "Multiple program participation: Comparison of nutrition and food assistance program benefits with food costs in Boston, Massachusetts." *Am. J. Pub. Hlth.* 79: 591-594.
- WILKINSON, R.G. (1992). "National mortality rates: The impact of inequality?" *Am. J. Pub. Hlth.* 82(8): 1082-1084.
- WILKINSON, R.G. (1989). "Class mortality differentials, income distribution and trends in poverty 1921-1981." *J. Soc. Pol.* 18(3): 307-335.
- WILKINSON, R.G. (ed.). (1986). *Class and Health: Research and Longitudinal Data*. Tavistock, London, England.
- WILLIAMS, D. (1990). "Socioeconomic differentials in health: A review and redirection." *Social Psych. Q.* 53(2): 81-99.
- WILLIAMS, D. (1992). Presentation at the Conference, "The Role of Class, Race and Ethnicity in Health Services Research," in Leesburg, Va., sponsored by the American Association of Medical Colleges. Dec. 7.
- WILSON, W.J. (1990). Presidential address to the American Sociological Association. Washington, DC. August 12.
- WINKLEBY, M.A., JATULIS, D.E., FRANK, E., and FORTMANN, S.P. (1992). "Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease." *Am. J. Pub. Hlth.* 82(6): 816-820.
- WISE, P.H. and PURSLEY, D.M. (1992). "Infant mortality as a social mirror." *N. Engl. J. Med.* 326(23): 1558-1560.
- YU, E.S.H., CHANG, C., LIU, W.T., and KAN, S.H. (1985). Asian-white mortality differences: Are there excess deaths? Vol II: Crosscutting issues in minority health. Report of the Secretary's Task Force on Black and Minority Health. DHHS. Washington, DC.