

# MEASURING SOCIAL CLASS IN US PUBLIC HEALTH RESEARCH: Concepts, Methodologies, and Guidelines

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## ABSTRACT

Increasing social inequalities in health in the United States and elsewhere, coupled with growing inequalities in income and wealth, have refocused attention on social class as a key determinant of population health. Routine analysis using conceptually coherent and consistent measures of socioeconomic position in US public health research and surveillance, however, remains rare. This review discusses concepts and methodologies concerning, and guidelines for measuring, social class and other aspects of socioeconomic position (e.g., income, poverty, deprivation, wealth, education). These data should be collected at the individual, household, and neighborhood level, to characterize both childhood and adult socioeconomic position; fluctuations in economic resources during these time periods also merit consideration. Guidelines for linking census-based socioeconomic measures and health data are presented, as are recommendations for analyses involving social class, race/ethnicity, and gender. Suggestions for research on socioeconomic measures are provided, to aid monitoring steps toward social equity in health.

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## INTRODUCTION

It is the same cause that wears out our bodies and our clothes.

Bertrolt Brecht, c. 1938 (16)

In 1916, four years after its establishment, the US Public Health Service published its first systematic investigation of economic deprivation and ill health, as experienced by 3000 white married men and women garment workers and their families in New York City (93, 180). Presenting their results, the authors—Benjamin S. Warren, a surgeon in the Public Health Service, and Edgar Sydenstricker, the Public Health Service's first statistician—commented that:

Although the investigations and observations of those familiar with conditions among low-paid wage earners go to show that economic conditions have marked effects upon the health of wage-earners and their families, there is a general lack of statistical data indicating these effects (180, p. 1299).

Equally sparse data linking racial/ethnic and socioeconomic disparities in health led John W. Trask, an Assistant Surgeon General in the Public Health Service, to wonder, in that same year, whether “. . . if in the average community deaths could be classified according to economic status, that is, according to the family or household income, a difference in mortality rates would be obtained approximately as great as that resulting from a white and colored classification” (164, pp. 258–59).

Eighty years later, in 1996, Warren & Sydenstricker's observation and Trask's question are still germane. Although diverse US investigators have, over the years, conducted important studies documenting how population patterns of health, disease, and well-being reflect living standards and working conditions, routine analysis using conceptually coherent and consistent socioeconomic measures in US public health research and surveillance remains rare. Socioeconomic data typically have not been a component of published US vital statistics; data instead have been stratified solely by age, sex, and what is referred to as “race” (92, 124). Moreover, when socioeconomic data are included in public health analyses, they often are presented with little or no theoretical justification, are measured and modeled eclectically, and are primarily used by researchers to “control” for, rather than study the effects of, socioeconomic position on health (108, 125, 157).

In this review, we accordingly discuss concepts and methodologies concerning, and offer guidelines for measuring, social class and other aspects of socioeconomic position in the United States, overall, and as related to race/ethnicity and gender. Our aim is to provide public health researchers and advocates with a wider array of conceptual and practical tools to document and analyze causal relationships between socioeconomic position and health; we do not attempt a comprehensive review of evidence and explanations regarding links between the two. Although we focus on the United States, we believe that issues we address are relevant to broader efforts to document, explain, and reduce social inequalities in health within and between nations worldwide. The better health

and longer lives of the “better off” imply possibilities of what “health for all” could truly mean, and it is this possibility that frames our recommendations for appropriate measurement of socioeconomic position in public health records and research.

## BACKGROUND: WIDENING SOCIAL INEQUALITIES IN HEALTH AND WEALTH

Before considering *how* to conceptualize and measure social class and other aspects of socioeconomic position, we review briefly *why* such measures are important.

First, centuries of evidence—dating back to ancient Greece, Egypt, and China—demonstrate strong associations between socioeconomic position and morbidity and mortality: Poor living and working conditions impair health and shorten lives (4, 145, 146, 157). These associations persist well into the late twentieth century, despite marked improvements in living standards and medical care, and are not substantially explained by known biomedical and behavioral risk factors (1, 51, 115, 157). In both industrialized and less industrialized countries, socioeconomic gradients are apparent for infant mortality, adult mortality, acute and chronic infectious and noninfectious diseases, and psychiatric morbidity (13, 51, 56, 64, 162, 189).

As documented by a considerable body of research, no single “factor” accounts for links between socioeconomic position and health. Instead, numerous investigators have delineated myriad interconnected pathways, preceding conception and ending at death, whereby people's health is harmed or helped by their standard of living, workplace conditions, and social and psychological interactions with others at home, work, and other public settings (1, 17, 39, 51, 83, 94, 112, 115, 125, 157, 162, 189). Mediating these pathways is their society's commitment to ensuring healthy living and working conditions and to minimizing social and economic inequality. At issue is how we, as social actors and biological organisms, literally incorporate—into our bodies—ways in which we live, work, love, fight, and play, in our homes, workplaces, communities, and society at large (91, 103).

A second reason for incorporating socioeconomic data into public health records and research is that growing national and international inequalities in income and wealth portend growing socioeconomic inequalities in health. During the 1970s, income inequality in the United States began to increase, after having narrowed considerably in the 1960s, and then rose sharply in the 1980s (31, 36, 183, 193). Between 1974 and 1994, the top 5% of US households (ranked by income) increased their share of the nation's aggregate household income from 16% to 21%, that of the top 20% rose from 44% to

49%, while the share among the bottom 20% shrank from 4.3% to 3.6% (36). By 1991, the median net worth of households in the highest income quintiles was \$122,166, and these households owned 44.7% of total household net worth; for those in the lowest income quintile, the corresponding figures were \$5225 and 7.0% (48). Such concentration of and disparities in wealth have not been evident in the United States since the 1920s (193). Income inequality has also been increasing in Western, Central, and Eastern European countries (31). The United States, however, has the dubious distinction of ranking first among industrialized nations in inequalities in both income and wealth (148, 193).

Reflecting this growing economic inequality, evidence indicates that socioeconomic inequalities in health in industrialized nations are increasing, even though mortality rates overall are declining. In the United States, studies have documented widening disparities in mortality by educational level (42, 54, 127) and by income level (42), comparing data from the 1960s to that of the late 1970s and 1980s. Moreover, the population attributable death rate due to poverty increased between the early 1970s and early 1990s, especially among black men and women (66). European studies likewise have documented widening socioeconomic gradients in mortality, from the 1950s onwards (101, 130, 162). These gradients, however, have been less steep and have increased less quickly in European nations with more egalitarian distributions of income and wealth, such as the Scandinavian countries (178). Additional studies further suggest that mortality rates for both children and adults in industrialized countries are directly related not only to poverty but also to degree of income inequality (82, 85, 186–188).

### SOCIAL CLASS AND SOCIOECONOMIC POSITION: CONCEPTUAL FRAMEWORK AND ANALYTIC IMPLICATIONS

Monitoring and understanding socioeconomic inequalities in health requires not only obtaining data on population health in relation to socioeconomic conditions, but also conceptual clarity about *what* socioeconomic parameters we are measuring, and *why*. In this next section, we present our understanding of social class, describe other dimensions of socioeconomic position, and discuss the importance of measuring socioeconomic position at multiple levels (individual, household, and neighborhood), with respect to time and in relation to race/ethnicity and gender.

#### *Social Class*

The meaning of “class” is complex (59, 117, 181, 195). We use “social class” to refer to social groups arising from interdependent economic relationships

**Table 1** Social class and socioeconomic position: definitions and implications for data analysis

<i>Definitions</i>	Socioeconomic position
<b>Social class</b> A social category referring to social groups forged by interdependent economic and legal relationships, premised upon people's structural location within the economy—as employers, employees, self-employed, and unemployed, and as owners, or not, of capital, land, or other forms of economic investments; possession of educational credentials and skill assets also contribute to social class position	An aggregate concept that includes both resource-based and prestige-based measures, as linked to both childhood and adult social class position. Resource-based measures refer to material and social resources and assets, including income, wealth, educational credentials; terms used to describe inadequate resources include “poverty” and “deprivation”. Prestige-based measures refer to individual's rank or status in a social hierarchy, typically evaluated with reference to people's access to and consumption of goods, services, and knowledge, as linked to their occupational prestige, income, and education level

#### *Implications for data analysis*

Levels	Time periods	Modeling of variables
Socioeconomic position can be measured meaningfully at three complementary levels: (a) individual, (b) household, and (c) neighborhood. Each level may independently contribute to distributions of exposures and outcomes	Socioeconomic position can be measured meaningfully at different points in the lifespan, e.g. infancy, childhood, adolescence, adult (current, past 5 yr, past 10 yr, etc). Relevant time periods depend on presumed exposures, causal pathways, and associated etiologic periods; cohort and period effects may also be operative	Social class is, conceptually, a nominal categorical variable; characteristics of socioeconomic position pertaining to material resources can be modeled as ordinal or interval categorical variables; socioeconomic status and other ranked hierarchical measures may be modeled as continuous variables (assuming no threshold effects), with cutpoints, if any, based on the structure of the data (e.g. quintiles)

among people (Table 1). These relationships are determined by a society's forms of property, ownership, and labor, and their connections through production, distribution, and consumption of goods, services, and information. Stated simply, classes—like the working class, business owners, and their managerial class—exist in relationship to and co-define each other. One cannot, for example, be an employee if one does not have an employer and this distinction—between employee and employer—is not about whether one has more or less

of a particular attribute, but concerns one's relationship to work and to others through a society's economic structure. Class, as such, is not an a priori property of individual human beings, but is a social relationship created by societies. One additional and central component of class relations involves an asymmetry of economic exploitation, whereby owners of resources (e.g. capital) gain economically from the labor or effort of nonowners who work for them. From an analytic standpoint, class is a nominal and categorical, not continuous, variable (196).

Conceptualizing class as a social relationship yields several insights useful for understanding social inequalities in both health and wealth. First, this construct helps explain why and how members of social classes advance their economic and social well-being and also why and how well-being of one class is causally linked to deprivation of others (59, 117, 125, 161, 197). To maximize profits in a capitalist economy, for example, corporate owners may seek to reduce the number of workers, their wages, or benefits; increase hours; introduce labor-saving technology; lobby for lower corporate taxes; or relocate to or buy facilities where workers sell their labor power for less, taxes are lower, and regulations regarding occupational safety and health and pollution are less stringent. Employed workers, in turn, may seek to improve their earnings through collective bargaining and legislation about wages and workplace conditions, work at more than one job, undergo additional job training, have additional family members enter the paid labor force, have fewer children, or accept concessions if fears of unemployment or underemployment run high. Class-related conflicts over taxes, government regulations, and government expenditures, whether military or civilian, likewise affect the economic and social well-being of nonemployed people aided by publicly financed programs, including children, retired workers, and both unemployed individuals and their families. Class understood as a social relation correspondingly helps explain generation, distribution, and persistence of—as well as links between—myriad specific pathways leading to social inequalities in income, wealth, and health.

### *Socioeconomic Position and Socioeconomic Status*

Social class, as a social relationship, is logically and materially prior to its expression in distributions of occupations, income, wealth, education, and social status. To refer concisely to these diverse components of economic and social well-being, as related to class position, we use the term "socioeconomic position" (Table 1). We employ this term, rather than the more commonly used phrase "socioeconomic status," because "socioeconomic status" blurs distinctions between two different aspects of socioeconomic position: (a) actual resources, and (b) status, meaning prestige- or rank-related characteristics.

With regard to actual resources, for example, one does or does not have a high school degree, a place to call home, or an income sufficient to sustain physical

survival and social participation in familial and societal roles and obligations. From an analytic standpoint, actual resources are, like social class, categorical in nature; they also can be ordinal or interval (e.g. own zero, one, or two or more cars). Prestige- or rank-related characteristics, by contrast, pertain to relative position in socially ranked hierarchies and chiefly concern status in relation to access to and consumption of goods, services, and knowledge. These characteristics typically are modeled as continuous variables, with cut-points for categorical analysis, if any, usually determined by the structure of the data, rather than a priori reference points.

### *Socioeconomic Context: Level and Time Period,*

#### *Race/Ethnicity and Gender*

Finally, we note that socioeconomic context—including social class and other aspects of socioeconomic position—can be conceptualized and measured with reference to both level and time, and is further mediated by other social relations, such as race/ethnicity and gender (Table 1).<sup>1</sup> Specifically, it may be meaningful to consider, simultaneously, measures of social class at the individual, household, and neighborhood or community level, with regard to both childhood and adult social class position, and also fluctuations in socioeconomic resources in a given time period. Individual-level class, for example, may be most relevant where workplace conditions are at issue, household-level class with regard to familial resources and standard of living, and neighborhood-level social class with regard to community-based hazards and resources, ranging from presence of garbage and liquor stores to presence of parks and community organizations (94). Depending on etiologic period, meaning time interval between exposure and onset of disease, health outcomes may also be related to childhood or adult socioeconomic position, or both, as well as to age at entry into the labor market, class mobility (or lack thereof), and spells of unemployment or poverty (44, 115). Cohort and period effects may also be relevant: For example, relative earning potentials of educational credentials, e.g. high school graduate, may differ markedly for degrees earned in 1950 versus 1990 (107).

Additionally, complexities of class, racial/ethnic, and gender relations imply that reliance upon single measures (at a given level or at a given time) may be insufficient to delineate how socioeconomic position shapes racial/ethnic and gender disparities in health (40, 94, 190). Poor black and Latino families, for example, are more likely to live in impoverished neighborhoods than poor white families (119, 192). As accordingly noted by Wilson in *The Truly Disadvantaged*, any "simple comparisons between poor whites and poor blacks... reflect, to some unknown degree, the relatively superior ecological niche many poor

<sup>1</sup> "Race/ethnicity" and "gender" are both social constructs, not biological categories, reflecting, respectively, oppressive systems of race relations (27, 94, 105, 190) and culture-bound conventions, roles, and behaviors for, as well as relations between, women and men and boys and girls (40, 76, 96).

whites occupy" (192, p. 58). Growing participation of women in the paid labor force, along with increasing recognition of diverse types of households—including both lesbian or gay and multigenerational or extended families—further suggest that measuring both individual- and household-level social class will become increasingly relevant for analyses of health among both women and men (6, 94). Legitimacy of commonly used strategies of "controlling" for socioeconomic position when analyzing racial/ethnic or gender differences in health, by using only one or a few socioeconomic variables, typically measured at one level and at one point in time, is thus open to question (94, 105, 132, 190); greater refinement of this approach may thus be warranted.

Clarity about links between socioeconomic position, race/ethnicity and gender are important because, absent socioeconomic data, racial/ethnic disparities in health have typically been construed as signs of genetic difference, even at times of cultural inferiority, rather than as powerful clues about how economic forms of racial discrimination, past and present, along with noneconomic aspects of racial discrimination, harm health (27, 94, 105, 190). Similarly, understanding of determinants of women's health would be enhanced by inclusion of data on women's economic position, in addition to women's social roles (7, 40, 62).

In distinguishing between diverse aspects and dimensions of social class and other expressions of socioeconomic position, we underscore that the issue is not whether one measure is "right" or another "wrong." Rather, as we review, numerous studies suggest that measures at each level, over time, may be informative, separately and in combination, such that effective research strategies may require gathering and analyzing data at all three levels, across the lifespan.

## MEASURES OF SOCIAL CLASS AND OCCUPATIONAL CLASS: INDIVIDUAL, HOUSEHOLD, AND NEIGHBORHOOD, OVER THE LIFESPAN

### *Individual*

To date, relatively little empirical social science or public health literature has operationalized measures of social class premised upon conceptualization of class as a social relationship. One notable exception concerns the work of sociologist Erik Olin Wright, who has developed theoretically and methodologically rigorous measures of social class for research on class structure, class mobility, income inequality, and gender authority in workplaces (194–201). In addition to developing a comprehensive survey to measure social class position (194), Wright has distilled these questions to a smaller subset (198), which we present in Table 2.

**Table 2** Wright's Social Class Typology (short version) version\*

Q1.	Which of the following best describes the position which you hold within your business or organization? Would it be a managerial position, a supervisory position, or a nonmanagement position		
	1.	Managerial	
	2.	Supervisory → Go to Q2	
	3.	Nonmanagement/Non-supervisory → Go to Q2	
Q1a.	Would that be a top, upper, middle, or lower managerial position?		
	1.	Top	
	2.	Upper	
	3.	Middle	
	4.	Lower	
Q2.	The next question concerns policy making at your workplace: that is, making decisions about such things as the products or services delivered, the total number of people employed, budgets, and so forth. Do you participate in making these kinds of decisions, or even provide advice about them?		
	1.	Yes	
	2.	No	
Q3.	As an official part of your main job, do you supervise the work of other employees or tell other employees what work to do?		
	1.	Yes	
	2.	No	

Wright's coding rules

	Q1 Hierarchical	Q2 Decision making	Q3 Supervision
1. Managers	Managerial	Yes	Yes
2. Supervisors	Supervisory	No	Yes
3. Workers	Nonmanagement	No	No

Question Q1a can be used to assign managers into top, upper, middle, or lower categories. Questions on educational level and job autonomy ("Is yours a job where you are required to design important aspects of your own work and put your ideas into practice?") can be used to categorize: "experts and credentialed employees," defined as persons in professional and managerial occupations and who have a bachelor's degree or more education; "semi-skilled or semi-credentialed" employees, defined as school teachers, craft workers, managers and technicians who have less than a bachelor's degree, and also sales and clerical workers with a bachelor's degree or more who hold jobs that provide autonomy; and "unskilled or uncredentialed" workers, defined as manual and non-craft workers and also sales and clerical workers who have less than a college degree or lack autonomy in their work

\*Reference 198

Wright's measurement of social class position is based on his thesis that social classes in contemporary society are rooted in complex intersections of three forms of exploitation involving: (a) ownership of capital assets, (b) control of organization assets, and (c) possession of skill or credential assets (194, 198). Wright further notes that some people, especially credentialled professionals, can occupy "'contradictory class locations within class relations,' insofar as they are simultaneously exploited through capitalist mechanisms and exploiters through skill or other secondary mechanisms" (197, p. 95). His questions accordingly measure: (a) capital assets, with reference to employment (employer, self-employed, or employee) and, if an employer, number of employees; (b) organization assets, in terms of position within a managerial hierarchy and participation in decision-making within the organization; and (c) skill and credential assets, with regard to employment in occupations that require scarce, and especially credentialled, skills (e.g. MPH, MD, PhD). Wright's typology ultimately distinguishes between four basic class categories: wage laborers; petty bourgeois (self-employed with no more than one employee); small employers (2–9 employers); and capitalists (10 or more employees). Measures of social class operationalizing the construct of class as a social relation, such as those developed by Wright, are only just beginning to be incorporated into public health research (89, 153).

A different kind of socioeconomic measure—also called "social class" but more accurately termed "occupational class"—has been used in European public health surveillance and research. Among the best known and longest employed of these occupational class measures is the British Registrar General's social class schema. Developed by the Registrar General THC Stevenson in 1913, this approach conceptualizes occupations as a measure of what Stevenson termed "standing within the community" or "culture" (156, 158). This schema has proven to be powerfully predictive of inequalities in morbidity and mortality, especially among employed men (67, 115, 162). Its five categories are: Social Class I (professional), Social Class II (intermediate), Social Class IIIM (skilled nonmanual), Social Class IIM (skilled manual), Social Class IV (partly skilled), and Social Class V (unskilled). Distinctions between social classes are based on a graded hierarchy of occupations ranked according to skill. Other European countries also use measures of occupational class that, like the Registrar-General's schema, are based on skill and status (56), as are the occupational categories employed in the US census, first developed by Alha Edwards in the early 1900s (46, 93). Both European and United States data provide evidence of socioeconomic disparities in health status and mortality by occupational groups (25, 67, 115, 137, 162).

One limitation of socioeconomic indicators based on occupational classifications is that they may not comparably capture disparities in working and living

conditions across divisions of race/ethnicity and gender. Black workers, for example, are more likely than their white counterparts in the same occupations to be exposed to carcinogens and other pathogenic conditions at work, and also to be paid less, even after taking into account job experience and education (32, 37, 200). Research in the United Kingdom has also shown that women workers are concentrated into fewer and less well-paid occupations, as compared to men, in each level of the Registrar General's Social Classes (132).

An additional liability of occupation-based measures is that they cannot readily be used for social groups outside of the recognized paid labor force (6, 132). These groups include: nonretired adults who are unemployed, homemakers (chiefly women) who do not work outside of the home, persons employed in informal or illegal sectors of the economy, and also groups not expected to be in the active labor force, i.e. children and retired adults. Approaches to measuring social or occupational class of these groups usually rely upon finding proxy measures: last or main occupation, in the case of unemployed and retired workers; spouse's occupation, in the case of homemakers; and parents' (or, more typically, father's) class, in the case of children. Such proxy measures can be informative. British studies indicate that measures of occupational class based on last occupation, for example, are predictive of chronic illness among men and women who are unemployed (5) or retired (8). As we discuss below, data on spouses' or partners' social class can also be predictive of health outcomes among people not in the paid labor force.

Categorizing social or occupational class based on parents' or father's occupation adds an additional dimension to measurement: that of time. Exposure to adverse conditions in infancy, childhood, or adolescence, for example, may affect health status in mid-life or later years, just as class-related experiences during working years may affect health status in retirement (8, 112, 115). Class mobility in its own right (or lack thereof) may also influence health (115, 189). Only a handful of United States and European studies, however, have simultaneously examined contributions of childhood and adult social or occupational class to adult health outcomes: most (19, 60, 68, 97, 109, 128, 179), but not all (110), have found both independently contribute to adult health status.

### *Household*

The construct of childhood class position in turn extends measurement of socioeconomic position to another level: household class, meaning social class position of the household in which individuals reside. Two women, for example, or two men, may both be nurses. They might live alone, they might be each other's domestic partner, or one might have a physician, and the other a laboratory technician, as a spouse or partner. Data on the class position of only

the individual nurse would thus not necessarily tell the full story of her or his household class position. Although the importance of measuring household class may seem self-evident, many public health studies and records report data using only individual-level measures of socioeconomic position.

Two different approaches to measuring household class are: (a) to equate household class with the most dominant and powerful individual class position in the household, regardless of gender (what British sociologists define as the "dominance approach," as compared to the "conventional" approach, employed in the Registrar-General's scheme, where men, married or not, and single women, retain their own occupational class, while married women are assigned their husband's class), and (b) to classify households by the actual, and at times discordant, class and gender composition of the relevant heads-of-household (termed the "cross-class" approach) (30, 139, 154). In 1981, for example, fewer than half of married women in paid employment enumerated in the census in the United Kingdom were assigned to the same occupational class as their husbands, and nearly half of the women individually assigned to Classes I through IIIIM and a quarter of those assigned to Class IIIIM had a higher class rank than their husbands (111).

Research on household class in relation to health is relatively new and chiefly has been conducted in Europe, especially Great Britain (6, 8, 28, 111, 116, 132). Paralleling the gender skew evident in social science literature on household class, most studies have compared household versus individual measures of social class for women, not men, even though married men's health status arguably may be affected by their wives' class position; research typically has also presumed a heterosexual nuclear family structure. Like their sociological counterparts, public health investigations studies have found that outcomes (e.g. health status) among married women typically are more strongly associated with their husbands' rather than their own social class, but that women's individual social class may be relevant as well. This research also provides evidence that occupational class categories based on male distributions of occupations may underestimate class differences in health among women (111, 132).

To our knowledge, little comparable research exists in the United States. One small study using the "dominance" approach, however, found that women's reproductive history was more strongly associated with their household, rather than individual, class (89). Few public health studies have likewise considered household class in relation to economic units of survival not living under one roof. This may be particularly important for studies among immigrants (118) and among members of neighborhood-based kin groups or social networks (140, 155).

### *Neighborhood*

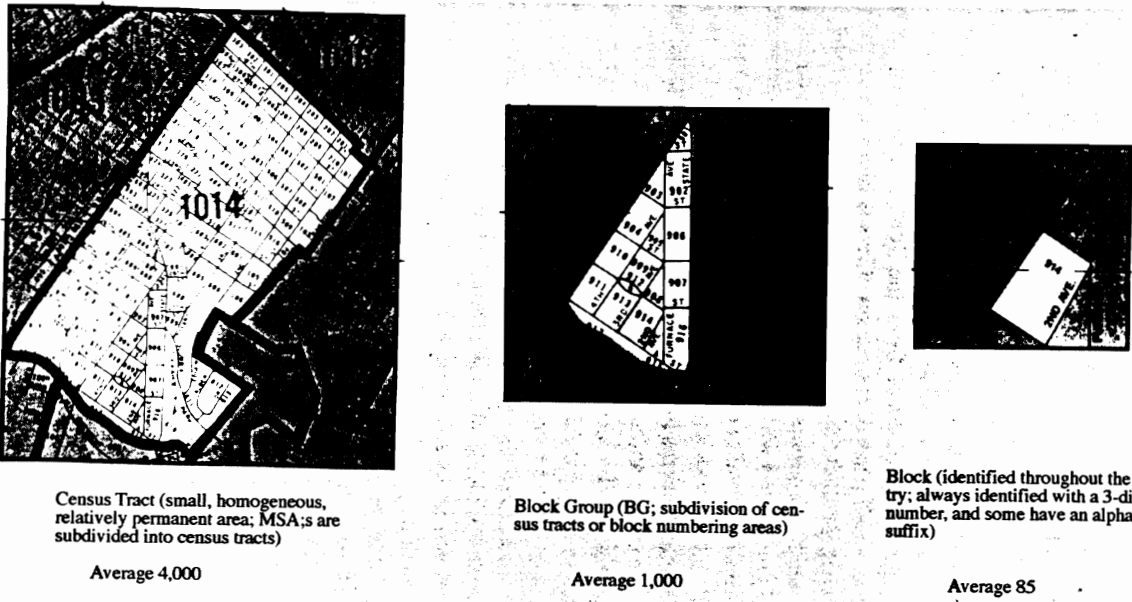
In addition to residing in households, individuals live in neighborhoods. These neighborhoods can also be characterized in terms of their social class composition.

Most US studies analyzing health in relation to neighborhood socioeconomic characteristics rely upon neighborhood units defined and characterized by the US Bureau of Census. Figure 1 presents three census-defined regions relevant to determining neighborhood social class: the census tract (or "block-numbering area" in rural regions), with an average population of 4000 residents; the census block-group, with an average of 1000 residents; and the census block, with an average of 85 residents (175). As of 1990, the Bureau of the Census assigned block-group codes to all parts of the nation. Census block-group data can be obtained from what is called "Summary Tape File 3A" (STF3A) (168, 175).

Census tract and block-group boundaries are intended to demarcate populations relatively homogenous with regard to social and economic characteristics. Block-groups, however, tend to be more homogenous than tracts and can reveal otherwise hidden pockets of poverty and affluence (89, 90, 142, 166). One well-known example concerns hills, which often occur within tracts: wealthier people tend to live on top and poorer people toward the bottom (90). Census tract data obscure these differences, whereas census block-group data may allow these differences to be seen. Although block data can likewise demarcate between wealthier and poorer areas of block-groups, block data are less useful for health research since, to protect confidentiality, relatively little socioeconomic data are reported at the block level (80, 166).

Zip code—defined areas are an option of last resort for classifying social class composition of neighborhoods. Unlike tracts and block-groups, zip codes span relatively large geographic areas containing upward of 30,000 people typically not homogeneous in their sociodemographic characteristics (80). The underlying rationale for zip code boundaries, which routinely cut across census tracts, is to facilitate delivery of mail, not to characterize populations. Zip codes can thus include markedly different types of neighborhoods: In San Francisco, for example, one of the poorest neighborhoods, the Tenderloin, shares the same zip code as one of the richest neighborhoods, Nob Hill.

Although no census-derived data explicitly measure social class as a social relationship, census occupational data can be meaningfully grouped to create a class-based measure of neighborhood social class. Table 3 provides one approach to combining the 13 US census-defined occupational groups to arrive at class-based categories, premised on Wright's class typology (200). This measure has been validated in two US public health studies (89, 90) and has been shown to be associated with breast cancer incidence and survival (12, 88).



Census Tract (small, homogeneous, relatively permanent area; MSA's are subdivided into census tracts)

Average 4,000

Block Group (BG; subdivision of census tracts or block numbering areas)

Average 1,000

Block (identified throughout the country; always identified with a 3-digit number, and some have an alphabetic suffix)

Average 85

Figure 1 Census tract, census block-group, census block (175).

Table 3 Examples of US census-based measures of socioeconomic position and UK census-based indices of deprivation<sup>a</sup>

US census-based measures of socioeconomic position	UK census-based indices of deprivation
<p><b>Social class:</b> % working class</p> <p>Defined as % of employed persons in 8 of 13 census-defined occupational groups:</p> <ul style="list-style-type: none"> <li>Administrative support</li> <li>Sales</li> <li>Private household service</li> <li>Other service (except protective)</li> <li>Precision production, craft, repair</li> <li>Machine operators, assemblers, inspectors</li> <li>Transportation and material moving</li> <li>Handlers, equipment cleaners, laborers</li> </ul>	<p><b>Townsend index</b></p> <ul style="list-style-type: none"> <li>Unemployment: % economically active residents aged 16-64 and unemployed</li> <li>No car: % households with no car</li> <li>Rented: % households not owner occupied</li> <li>Overcrowding: % &gt; 1 person/room</li> </ul> <p>Note: index does not weight variables, uses log transformation of % unemployment for standardization</p>
<p><b>Working-class neighborhood:</b> ≥66% of employed persons in working-class occupations</p> <p><b>Poverty:</b> % persons below poverty line</p> <p><b>Poverty area:</b> ≥20% of persons below poverty</p> <p><b>Additional measures:</b> % of persons at &lt;50%, 50-100%, 101-200% of poverty line</p> <p><b>Wealth:</b> % of households owning home</p> <ul style="list-style-type: none"> <li>% of households owning 1 or more cars</li> <li>% of households with annual family income ≥\$50,000 or more</li> </ul> <p><b>Education:</b> % of adults age 25 and older with less than a high school degree</p> <p><b>Undereducated neighborhood:</b> ≥25% of adults with less than a high school degree</p> <p><b>Alternative:</b> % of adults age 25 and older who have completed ≥4 years of college</p> <p><b>Crowding:</b> % of persons living in households with ≥1 person/room</p> <p><b>Population density:</b> persons/square mile</p>	<p><b>Breadline index</b></p> <ul style="list-style-type: none"> <li>Unemployment: % economically active population unemployed</li> <li>No car: % households with no car</li> <li>Rented: % households not owner occupied</li> <li>Lone parents: % lone parents as proportion of all households</li> <li>Long-term illness: % households with a person with a limiting long-term illness</li> <li>Low social class: % persons in social class IV or V</li> </ul> <p>Note: index estimates % poor using weights derived from a validation survey</p> <p><b>DoE 91 Index of Local Conditions</b></p> <ul style="list-style-type: none"> <li>Unemployment: % unemployed persons</li> <li>Poor children: % households with no earner or one parent in part-time employment</li> <li>Overcrowding: % households with &gt; 1 person per room</li> <li>Lack amenities: % households lack or share baths/shower and/or water closet, or in non-permanent housing</li> <li>No car: % households without access to a car</li> <li>Flat children: % children living in flats, not self-contained or non-permanent housing</li> </ul> <p>Note: index does not weight variables; uses X<sup>2</sup> standardization</p>

<sup>a</sup>References 90, 106, 168.



prevalence of sexually transmitted diseases (47), and smoking status, parity, height, and hypertension (89, 90).

To date, only five US studies have examined the validity of using block-group, tract, or zip-code socioeconomic data for public health research (23, 58, 63, 89, 90). These investigations obtained individual-level health and socioeconomic data, geocoded individuals' residential addresses (i.e. they identified their relevant census codes), and appended relevant census-based socioeconomic data to the individuals' records. Two of the studies used individual-, household-, and census-tract and census block-group measures of social class and found that estimates of associations between an individual's block-group level social class position and specified health outcomes (e.g. elevated blood pressure, height, smoking status, number of births) were similar to, but tended slightly to underestimate, associations between those same health outcomes and individual- or household-level social class position; estimates based on census-tract data were less precise (89, 90). Another two used census-tract and household-level measures of annual family income and likewise found that estimates of risk ratios based on census data tended to underestimate those based on individual's socioeconomic data (23, 63). The fifth study used zip code-level data on median family income and educational level along with data on individuals' family income and educational level and found divergent results: In some cases, estimates of socioeconomic effects based on zip code-level data were larger, and in other cases smaller, than those based on individual-level data (58). Differences in estimates based on individual- and neighborhood-level data depend, in part, on the degree of socioeconomic heterogeneity in the specified neighborhood and thus the extent to which a summary measure of neighborhood conditions is meaningful. To improve validity, studies accordingly should employ the smallest and most homogeneous census-defined region feasible, i.e. the census block-group. A study conducted in Australia likewise supports use of data from the level of collector's districts (analogous to block-groups) rather than larger postcodes (77).

Use of neighborhood-level data requires attention to limitations as well as strengths. Composition of neighborhoods, for example, can change over time (119), thereby potentially diluting estimates of effects. Also of concern is ecologic fallacy, which occurs when both the dependent and independent variables are based on group-level data and confounding is introduced through the grouping variable (3). Inflated estimates of the effect of socioeconomic position on health (comparing neighborhood- to individual-level measures), for example, can occur if neighborhood-level variables are correlated with residuals in the individual-level analysis (58). Empirical evidence to date, however, suggests that underestimation of socioeconomic effects (due to socioeconomic heterogeneity in the neighborhood), not overestimation, is the more likely bias (23, 63, 77, 89, 90).

Discussion of ecologic fallacy, in turn, raises consideration of another kind of bias, termed "individualistic fallacy" (3). Individualistic fallacy occurs when population patterns of outcomes of interest are erroneously presumed to be explained only by individual-level characteristics. One strategy to avoid this bias, chiefly used in social science research, is contextual analysis and multilevel or hierarchical models (15, 20, 38, 78). In this approach, models use both individual- and group-level data to examine how each contributes to the individual-level outcome of interest. A handful of public health studies have yielded suggestive evidence of socioeconomic contextual effects in relation to parity (89, 90), mortality (65), and domestic violence (126). Interested readers are encouraged to review the cited literature to learn about methodologic issues relevant to conducting and interpreting contextual or multilevel analyses.

Neighborhood-based measures of social class and other aspects of socioeconomic position merit greater use in public health research and surveillance (90, 106). First, they characterize aspects of people's living conditions not captured by individual- or household-level measures, which may be especially important in studies involving people from diverse racial/ethnic groups, given the greater likelihood, at each socioeconomic level, of white individuals to live in more affluent, safer, and less polluted neighborhoods than individuals of color (26, 104, 119, 192). Second, neighborhood-based socioeconomic measures can be used for persons of all ages, from infants to retired adults, and can be applied similarly to men and to women. Third, they may provide a more stable estimate of people's relevant economic circumstances, as compared to more volatile income data or more static measures of education (both of which we discuss in the next section) (150). Fourth, census-derived measures of neighborhood social class can be used to construct population-based incidence, prevalence, and mortality rates stratified by social class, since denominators for these rates are also census-based and can be classified in the same manner (47, 88). Fifth, and perhaps most importantly, neighborhood-based measures permit the conduct of contextual analyses, thereby gaining insight into how social class, at multiple levels, shapes population patterns of health, disease, and well-being.

## ADDITIONAL MEASURES OF SOCIOECONOMIC POSITION

The social relationship of class exerts its influence on population health in part through specific aspects of socioeconomic position. In this next section, we accordingly review measures pertaining to income, poverty, material and social deprivation, wealth and assets, education, and socioeconomic indices and prestige-based measures, again in relation to level, time period, and both race/ethnicity and gender.

*Income*

Income is not a simple variable. Components include wage earnings, dividends, interest, child support, alimony, transfer payments such as Aid for Families with Dependent Children (AFDC), and pensions. To capture this complexity, the Survey of Income and Program Participation (SIPP), a well-established longitudinal study, collects data on more than 50 components of income and also obtains extensive data on who is supported by this income (170). By contrast, many US public health studies typically include only one question about "annual family income" at one point in time, often without regard to number of persons supported by this income. Health consequences of an annual family income of \$15,000, however, may be markedly different for a family of one adult, of two adults and two children, or one adult and four children.

SIPP and other economic surveys, moreover, reveal that income can be extremely volatile and fluctuate considerably over the course of a year, let alone over many years (44, 170). As shown by data from a national probability sample of US households, in 1984 over 50% of the US population lived in households that experienced a large monthly income change, defined as an increase of more than 50% or decrease of more than a third (173). Measures at one point in time may thus fail to capture important information about income fluctuations.

Collecting and analyzing individual and family- or household income data can be subject to additional problems. In the United States, nonresponse to questions about income often is high, and income tends to be poorly reported, especially by individuals with high incomes (71). To increase reliability of reporting, researchers have developed various techniques, including use of response cards, bracketing, and imputation (71, 72).

Knowledge of household income, moreover, may not necessarily be predictive of either purchasing power or income available to individuals in the household. Studies show that goods and services available to whites and residents of higher-income neighborhoods tend to be better in quality and lower in price than those available to blacks and residents of lower-income neighborhoods (81, 113, 165). Compared to whites, African Americans pay higher prices for new cars (10), higher property taxes on homes of similar value (143), higher costs for food (2), and mortgages (131). Additionally, research in the United States (159) and in Great Britain (62) has found that, especially among poor working-class families, allocation of income and income-dependent resources may vary by gender and age. Specifically, mothers in low-income families may skip on using income for themselves to provide first for their children's or husbands' needs.

Both income level and income dynamics have important implications for health. US data indicate that, despite difficulties in obtaining accurate income data, even simple categorical measures of annual personal and family income

at one point in time are strongly associated with myriad health outcomes (1, 135, 176, 177). In 1986, for example, only 4.3% of the US population with incomes of \$35,000 rated their health as "fair or poor," as compared to 20.4% among those with incomes under \$10,000 (177). Studies also show that small differences in income are associated with much larger changes in health status among poor as compared to wealthy families (11, 86). Assuming a constant effect per unit change in income, or using income as a simple continuous linear variable, may thus be inappropriate. Additionally, a recent study based on data from the Panel Survey of Income Dynamics (PSID) prospectively observed a 30% increased risk of mortality among individuals who experienced one sharp income drop during a five-year period as compared to individuals whose incomes remained relatively stable, while two or more sharp drops of income were associated with a 70% greater risk of mortality (44). Notably, this study's prospective design guarded against possible bias due to reverse causation (e.g., association between illness and income due to illness leading to income loss, rather than income loss leading to illness).

Neighborhood- or regional-level data on income are also relevant to understanding population health. Two recent US studies provide evidence of strong income gradients in mortality over a 16-year follow-up period, using zip code-based measures of median family income (150, 151), and others have used census-based income data to document socioeconomic disparities in cancer incidence and survival (34, 35, 63, 142) and use of health services (23). Moreover, a study on child and adolescent development used neighborhood income data in conjunction with family income data and found that children living in low-income families who lived in high-income neighborhoods fared better, on a wide array of developmental and health indices, than children in low-income families living in low-income neighborhoods, thus providing evidence of contextual effects (18).

Income data at the neighborhood or regional level also permit analyzing health in relation to population distributions of income, rather than simply income level. Two recent US studies (82, 85) found evidence of direct association between states' level of income inequality and their mortality rates, even after taking into account population rates of poverty, smoking, and alcohol consumption. One measured income inequality in terms of the proportion of total household income received by people in the bottom half of the population (82). The other used a measure known as the "Robin Hood index," which summarizes the share of income that would have been transferred from those above the mean to those below the mean to achieve equal distribution of income (85). Other studies documenting associations between income inequality and mortality rates among industrialized nations have used the Gini coefficient, a standard index of income inequality (186–188).

### Poverty

An alternative way of evaluating income in relation to need and to health is to consider income in relation to poverty. Unlike income, poverty is a normative construct: Determining what counts as poverty, including whether there is a "poverty level" or "poverty threshold," involves judgments about social norms (84, 141, 161). One approach is to set the poverty threshold at one half of the national median income. Another is to set the threshold at a subsistence level related to biological survival, the approach underlying measurement of poverty level in the United States (141). Official measurement of poverty has much to do with how "the poor" are defined and regarded (84, 141). Information on the US poverty threshold for families of different size and age compositions is readily available in Census Bureau publications such as the P-60 series (174).

The current US poverty line is based on a threshold established in 1964, as part of then President Lyndon B. Johnson's newly announced "War on Poverty," a policy galvanized by growing awareness of, and organizing by, poor people in the United States (84, 141). The poverty level was then set at three times the cost of what was termed an "economy food plan," and was further adjusted for family size, gender of family head, number of children under 18 years, and farm versus nonfarm residence. According to a report recently issued by the Committee on National Statistics of the National Academy of Sciences, however, this approach to measuring poverty is marred by several flaws, including erroneous assumptions about proportions of income spent on food (24).

Even if a better "poverty threshold" could be developed, focusing simply on the dichotomy of "above" versus "below" poverty can obscure the full gradient of inequalities in income distribution and in health (71). Alternatively, income can be assessed in relation to need, which can be measured by evaluating how far above or below a family is in relation to the official poverty threshold, e.g. at 50%, 75%, 150%, or at 200% or more of the poverty line (44, 183). Determining how far below the poverty line people are may be particularly important in studies of poor populations, as related to both race/ethnicity and gender. Tellingly, although the proportion of the US black population living in poverty has remained fairly stable since the late 1960s, average incomes of the black poor have eroded badly (73). Reflecting these trends, in 1992, 16.3% of the black population and 10.9% of the Hispanic population lived below 50% of the poverty line, as compared to only 4.3% of the white population; corresponding figures for households with children under age 18 that were headed by single women as compared to married couples were 30.3% and 3.3%, respectively (171).

As in the case of income, poverty is a dynamic experience. Knowing about poverty at a given point in time is not the same as evaluating poverty over time.

Between 1990 and 1991, 6.2 million persons in the United States moved into poverty and 5.1 million persons moved out of poverty, with the likelihood of exiting poverty greater among whites as compared to blacks and Hispanics and among working age as compared to elderly adults (171). Contrasts between "poverty spells" versus persistent poverty (44, 170) are further underscored by data showing that, between 1991 and 1993, approximately 20% of the US population was poor in any given two months, whereas only 5% was poor for all 24 months (144). Additionally, although blacks and Hispanics were two to three times more likely than whites to be poor for one or two months, they were four to five times more likely to be poor throughout these two years (144). That "poverty spells" and prolonged poverty may differentially impair well-being is suggested by a recent study's finding that although children who are occasionally poor score worse than children who are never poor on measures of intelligence and behavioral problems, deficits are much greater among children who are persistently poor (43).

Although measurement of poverty at the individual and family or household level could certainly be improved, strong associations exist between standard US measures of poverty and health (66, 176, 177). Moreover, if poverty were listed as a cause of death in the United States, in 1991 it would have ranked as the third leading cause of death among black men, fourth among black women, sixth among white women, and eighth among white men (66).

Lastly, poverty, like social class and income, can be measured at the neighborhood level. According to federal definitions, "poverty areas" consist of regions where 20% or more of the population is below the poverty line; if 40% or more of persons are below the poverty line, it is termed an "extreme poverty area" (167). This definition of "poverty area" has been employed in several US studies using census block-group data and has been shown to be associated with numerous health outcomes (47, 88–90).

### Material and Social Deprivation

The US approach to conceptualizing and measuring poverty, based on absolute need in relation to biologic survival, is only one way of comprehending impoverishment. Other approaches adopt a broader view. They recognize that although there is a level of destitution that renders physical survival impossible, people—as social beings—have additional material, social, and spiritual needs, linked to norms of their society and culture (41, 161). To operationalize such a construct of deprivation, Townsend—a British sociologist and one of the authors of *The Black Report* (162)—has developed a 77-item deprivation index that can be administered to individuals (161), in which variables pertaining to material deprivation concern "dietary, clothing, housing, home facilities, environment, location and work (paid and unpaid)," whereas those pertaining to

social deprivation refer to "rights to employment, family activities, integration into the community, formal participation in social institutions, recreation and education" (161, p. 93).

Townsend has also developed an area-based measure of material deprivation (163), which ranks as the most widely used measure of deprivation in the United Kingdom (61). This index, described in Table 3, is based on proportions of an area's population that are unemployed, do not own a car, do not own their homes, and live in overcrowded households (106, 163). Employing this measure, British research documents strong associations between deprivation and population health (21, 45, 61, 106, 163). Using the Townsend index, one British study has further shown that mortality rates among local authorities (analogous to US congressional districts) depend on both average level of deprivation in wards (analogous to US census tracts) and variation in levels of deprivation across wards within these local authority areas (14).

Other British area-based measures of deprivation exist and are reviewed by Lee et al (106), Carstairs (21), and Gordon (61). They include the Carstairs index, the Breadline Britain index, and the Department of Environment's index of local conditions (Table 3). Evaluating their associations with morbidity and mortality, both Lee et al (106) and Gordon (61) have concluded that weighted, validated area-based measures of multiple deprivation, like the Breadline index, are more interpretable and useful for guiding resource allocation than unweighted measures (which, de facto, weight each component equally).

In the United States, few researchers have attempted to develop or validate comparable indices of social or material deprivation. Mayer & Jencks, however, have operationalized a measure of material hardship, defined as unmet needs in the areas of food, housing, and medical care during the past year, since these are basic need areas in which noncash benefits are provided by the US government (120). The Mayer-Jencks measure of material hardship has been used in combination with measures of social support and social capital to examine infant health outcomes in urban communities (133). To our knowledge, no other systematic public health research has been conducted in the United States on area-based measures of material or multiple deprivation. Nor have studies, in either Europe or the United States, examined joint contributions of area-based measures of childhood and adult deprivation to health status over the life course.

### Wealth

If deprivation and poverty represent one end of a socioeconomic spectrum, privilege and wealth characterize the other. Investigations of relationships between wealth and health, however, are a relatively recent phenomenon, in the United States and elsewhere.

Perhaps the simplest definition of wealth is accumulated assets, typically accrued through inheritance, investment, and other forms of saving (48, 170, 193). As such, wealth is a source of economic security and power. Assets accordingly provide an index of a household's ability to meet emergencies or absorb economic shocks, such as unemployment or a health crisis (152, 170). Notably, households with comparable incomes can differ greatly in their total net worth: Age, race/ethnicity, and gender may matter. Income among retired pensioners, for example, may be comparable to that of younger workers, but pensioners are likely to have accumulated more wealth. Data from SIPP, moreover, show that in 1991 the median net worth of US white households (\$44,408) was 9.6 times that of black households (\$4,604) and 8.3 times that of Hispanic households (\$5345); that of married households (\$60,065) was 4.1 times that of female-headed households (\$14,762) (48). These racial/ethnic inequalities in wealth were starkest among households in the lowest income quintile: Median net worth of white households equaled \$10,257, as compared to only \$1 for black households and \$645 for Hispanic households (48). Knowledge of assets thus is more descriptive of economic resources than income.

In the United States, homes and cars represent the most commonly owned assets, and data on their possession and value are subject to low nonresponse bias (70). As income and wealth increase, however, so too does the proportion of wealth accrued as liquid assets or easily liquidated investments (e.g. stocks and bonds) (48, 170). In 1991, for example, 44.2% of households in the highest income quintile owned stock and mutual fund shares, as compared to only 5.7% among households in the lowest income quintile (48). Suggesting the importance of gathering data on wealth, data from the Survey of Asset and Health Dynamics of the Oldest-Old (age 70 years and older) yield evidence of nonlinear associations between health and both income and wealth, with associations strongest among people at the bottom of the income and wealth distribution: not surprisingly, in this population of retired adults, associations were also larger for wealth than for income (152). Additionally, European research has shown car and home ownership to be associated with mortality rates (55), health status among the elderly (8), and cancer survival (129). To our knowledge, no public health studies, in either the United States or Europe, have examined associations between health outcomes and neighborhood levels of wealth, nor have they examined how childhood and adult levels of wealth may jointly affect health status.

### Education

Among the most widely used indicators of socioeconomic position in US public health research is education. Reasons for its popularity include: ease of measurement; applicability to persons not in the active labor force (e.g.

homemakers, the unemployed, and retired); stability over adult lifespan, regardless of changes in health status; and association with numerous health outcomes (86, 108, 138, 189). Educational level among adults who have completed their schooling, for example, is not affected by occurrence of serious illness, which can force individuals to work at jobs below the level of their normal occupations or otherwise cause their incomes to decline. Selection of education as a practical measure of socioeconomic position for the 1989 revision of the US standard death certificate was based on these considerations (160).

Arguments that education represents the best or most valid measure of socioeconomic position are subject to debate on several grounds (92). First, the very fact that educational level generally is stable over adult lifespan may, for some study purposes, be a liability, not an asset, because stability may preclude capturing how changes in economic well-being in adulthood can alter health status (108, 149). Contrasts between fixed educational level and fluctuating socioeconomic resources most likely will become even more important in the future, in light of growing trends in corporate downsizing, increasing job insecurity, and changing occupational structure of the US economy (44, 98, 99). Second, because the span of educational levels is far less than the range of income or wealth, educational level may be a less sensitive measure for evaluating the magnitude of social inequalities in health (92). Third, and related, education is less predictive than class position of ownership of capital assets (184).

Fourth, educational level does not have a universal meaning. Rather, its economic and health implications are related to age, birth cohort, class position, race/ethnicity, and gender. During the twentieth century, educational level in the United States has risen in successive cohorts, leading to a growing homogeneity within younger cohorts and decreasing variability in years of education relative to income (107, 108). Moreover, economic returns for a given level of education are higher for managers as compared to workers, for whites as compared to blacks, Hispanics, and American Indians, and for men as compared to women (169, 172, 201). In 1989, among persons in the United States who had completed high school and who were over age 18 and working full-time, average annual earnings of white men (\$26,526) were \$5000 more than those of black and Hispanic men; white women earned about \$8000 less per year than white men, but about \$1000 more than black and Hispanic women (169). Other evidence indicates college-educated blacks are four times more likely than their white counterparts to experience unemployment and consequent drops in income (185). Assuming that effects associated with a given level of education are comparable for all sectors of the population is thus open to question, as is the argument (138) that education, by itself, provides a single sufficient measure of socioeconomic position.

Considerable evidence nonetheless demonstrates that individuals' educational level is an important predictor of mortality and morbidity in the United States (49, 54, 86, 127, 136), Europe (100, 102), and also less industrialized countries (13, 64). Inequalities in health related to educational level, moreover, are larger in the United States compared to Europe for both mortality (102) and morbidity (100), a finding the authors attributed to national variations in levels of egalitarian and economic policies. If educational level is used in health studies, it may be more meaningful to measure it in terms of credentials, rather than simply years of education, as commonly done in US research (92, 108). This is because a one-year difference between completing 9th versus 10th grade is not the same as the one-year difference between completing 11th and 12th grade, since only a person with a 12th grade education is certified as a high school graduate and thus in possession of a credential with important implications for employment prospects (52, 92).

In part because education typically is conceived of and measured as a fixed individual attribute, little public health research has explicitly examined associations between health outcomes and educational level measured at either the household or neighborhood level, or, among adults, with reference to childhood and adult educational resources. One US study of children's health, however, based on the National Health Interview Survey, assessed educational attainment of the children's most educated parent and found that this de facto measure of household educational level was predictive of children's physical well-being (136). The importance of considering parents' educational level as a measure of childhood socioeconomic resources relevant to childhood health status is likewise emphasized in two recent reviews by Hauser (70) and Zill (202).

Lastly, several studies have found associations between neighborhood or regional level measures of education and diverse health outcomes, including stroke mortality (22) and both cancer incidence and survival (33–35). One study defined undereducated block-groups as areas where 25% or more of adults age 25 or older had not completed high school and found that associations between this measure and the selected health outcomes were similar to those for individual-level measures comparing adults without and with a high school degree (90).

### *Socioeconomic Indices and Prestige-Based Measures*

Socioeconomic indices and prestige-based measures constitute two additional types of socioeconomic indicators. Employed primarily in US sociological, but not public health, research, they are conceptualized chiefly as measures of social stratification and social standing (69, 108, 122, 123, 182). Examples of indices include: Duncan's Socioeconomic Index (SEI), a composite score based on information pertaining to occupational prestige, income and education;

the Nam-Powers Occupational Status Score, based on the median income and education of persons employed in a given occupation; and the Nam-Powers Socioeconomic Status Score, which combines the Nam-Powers Occupational Status Score for a given individual's occupation with that person's educational level and family income. A fourth measure, the Hollingshead Index of Social Position, combines information on an individual's educational level and occupational rank, as based on Hollingshead's personal rating of people's relative social standing in New Haven, CT, in the early 1960s. [For detailed descriptions of how these indices are constructed, see reviews by Haug (69), Liberatos et al (108), and Nakao & Treas (122).]

Utility of socioeconomic indices for public health research remains unclear. To our knowledge, these indices have not been systematically evaluated or validated in public health research, nor have they been widely used. One concern is that combining measures of income and education into one index, with or without additional data on occupational prestige, can confiate pathways and obscure each component's distinct—and conceivably different—contribution to specified health outcomes (71, 108). It is thus advisable that studies using such indices first separately evaluate estimates of associations between each health outcome and the indices' component measures. Additionally, equivalence of both socioeconomic indices and prestige-based measures is problematic for comparisons across gender and race/ethnicity, given marked differences by race/ethnicity and gender in occupational distributions and in income associated with those occupations (69, 108). Evidence also suggests that occupational prestige ratings may be gender dependent: Men employed in typically "female" occupation (e.g., nursing) have been shown to be rated lower than women employed in the same occupation (182). Lastly, although measures based chiefly or exclusively on prestige ratings may be informative about associations between prestige and health, possessing prestige is not the same as possessing economic resources (182). Prestige-based measures accordingly do not provide information about how material aspects of socioeconomic position, such as social class position, income, poverty, deprivation, wealth, or education, shape population patterns of morbidity and mortality.

Despite these caveats, several studies have observed associations between health outcomes and prestige-based indices. Two studies, for example, found inverse relationships between the Nam-Powers Socioeconomic Status Score and several types of mental health problems, including cognitive impairment, schizophrenia, alcohol abuse, and major depression (74, 191). Another study used a modified Hollingshead index, combining data on education, occupation, and income, to evaluate childhood and adult socioeconomic position and found that prevalence of *Helicobacter pylori* infection among black and Hispanic

adults was strongly associated with childhood socioeconomic position, but weakly with adult socioeconomic position (114). One implication, noted by the authors, was that failure to obtain data on childhood socioeconomic position, when infection is most likely to take place, may account for why prior studies, using only data on adult socioeconomic position, did not find evidence that socioeconomic position contributes to the twofold greater prevalence of *Helicobacter pylori* infection among the black and Hispanic as compared to white population in the United States.

## STRATEGIES FOR IMPROVING SOCIOECONOMIC MEASURES FOR US PUBLIC HEALTH RESEARCH AND SURVEILLANCE

Public health research to develop and validate measures of social class and other socioeconomic characteristics clearly is necessary. In Table 4, we summarize recommendations regarding inclusion and analysis of measures of social class and other aspects of socioeconomic position in US public health research. Especially important is research to identify optimal measures for various public health data bases, including vital statistics, hospital discharge data, cancer registries, forms for reporting notifiable diseases, and detailed population-based longitudinal surveys. Although vital statistics and disease-registry data may not be the most appropriate vehicle for etiologic investigations, they are an indispensable source of descriptive data on social distributions of mortality and morbidity and trends over time. They also provide a unique source of routinely available data that can be used to aid health planning at the state, local, and tribal levels, a function not served by surveys based on national probability samples. Moreover, because public health research and surveillance inevitably must reckon with biologic as well as social processes, socioeconomic measures for documenting and analyzing population patterns of health, disease, and well-being should be developed and chosen with an awareness of likely pathways and etiologic periods.

### *A Research Agenda*

Accordingly, we offer three general research recommendations. First, theoretically grounded research is needed on how individual-, household-, and neighborhood-level social class and other aspects of socioeconomic position relate to each other and combine to affect health, resolving this question may entail applying and improving methodologies for conducting contextual and multilevel analyses of population health. Second, studies should focus on temporal dimensions of socioeconomic position (e.g., poverty spells) and examine

**Table 4** Recommendations regarding measures of social class and other aspects of socioeconomic position for public health research and surveillance

1. Routinely include consistent measures of social class and other aspects socioeconomic position in ALL public health data bases, and tabulate and report data stratified by social class, race/ethnicity, and gender (and age, if relevant)
2. Collect data on social class position, regarding structural location in the economy (e.g. owner, self-employed/professional, manager, supervisor, nonsupervisory employee), not just on economic resources
3. Determine relevant unit or level of measurement: individual, household, neighborhood (or region) socioeconomic position: consider contextual effects and multilevel analyses
4. Determine relevant time period: childhood and/or adulthood socioeconomic position; dynamics of income, poverty, employment
5. Consider relevant pathways by which social class and other aspects of socioeconomic position may affect the health outcome of interest and collect additional relevant data (e.g. for infectious diseases, measures of overcrowding in households or population density)
6. Avoid common mistakes:

Obtaining socioeconomic data only at the individual level, and not household level or neighborhood level

Gathering data only on current socioeconomic position, without considering socioeconomic position across the lifespan

Collecting data only on "annual family income" without reference to whom it supports

Treating income and poverty as static, not dynamic

Ignoring the full range of material and social deprivation and also population distributions of income, wealth, and deprivation

Modeling "years of education" and "income" as continuous data without regard for threshold or nonlinear affects

Ignoring wealth and specific types of assets

Ignoring measurement error and nonresponse bias

Treating "social class" and "socioeconomic status" as equivalent terms, and not distinguishing between resource- and prestige-based measures of socioeconomic position

Assuming that specific socioeconomic measures perform comparably in characterizing socioeconomic conditions across racial/ethnic groups and by gender

their consequences for health. Third, and related, research evaluating conjoint influence of childhood and adult social class and other components of socioeconomic position on health is necessary. Identifying causal dynamics underlying relationships between social class, socioeconomic position more broadly, and health will in turn require greater emphasis on prospective studies, so as to avoid bias due to reverse causation.

Rigorously implementing this research agenda will require systematically evaluating how social relations of class, race/ethnicity, and gender combine

to produce social inequalities in health. Beyond incorporating more comprehensive and theoretically grounded measures of social class and other aspects of socioeconomic position, studies may need to address how class-related experiences of racial/ethnic and gender discrimination (50, 53, 57, 75) may harm health (94, 105, 147, 190). Provocative data suggest that experiences of racial discrimination may be associated with blood pressure among African Americans (9, 79, 87, 95) and that patterns of association may vary by both social class and gender (95). Links between socioeconomic position and health may also be affected by factors pertaining to acculturation, migration, and generational status among Asian and Pacific Islander Americans, Latinos, and other racial/ethnic groups with large immigrant subpopulations (190). Determining how racial/ethnic and gender relations intertwine with class relations and jointly affect health within and across economic strata remains an outstanding challenge in contemporary public health research.

### *Augmenting Public Health Surveillance Data*

The necessity of supporting research to supplement vital statistics and other health data with appropriate socioeconomic measures recently has been recognized by the US and other governments. Attesting to this concern are recommendations of a 1994 conference on "Measuring Social Inequalities in Health" sponsored by the US National Institutes of Health (121, 134) and also the World Health Organization's new initiative on monitoring global inequalities in health (29). Amply demonstrating the value of such data are the UK's Registrar-General's Social Class categories, which, despite recognized limitations, serve as a foundation for contemporary public health knowledge about patterns and trends in social inequalities in health, and which also are used to help plan allocation of medical resources and public health interventions at the national, regional, and local level (162).

Even prior to establishing which socioeconomic measures should routinely be included in US public health surveys and data bases, unrealized opportunities exist to use the technique of geocoding to append census-based socioeconomic data to existing vital statistics, administrative records, medical records, and health surveys. As we have discussed, this approach could be employed to generate population-based morbidity and mortality data stratified by census-based measures of socioeconomic position. It could also be used to improve new and increasingly common techniques of adjusting for severity of disease to evaluate hospital outcomes and formulas for paying health care providers, since absence of data on socioeconomic characteristics of the population being served can distort interpretation of outcome measures and create disincentives to provide needed services to poor patients. Furthermore, if common identifiers were used in both administrative records and health

surveys, as currently is done in Finland and other Scandinavian countries (56), socioeconomic and health survey data could be linked to administrative records from Medicare and Social Security, thereby augmenting possibilities for tracking social inequalities in health and access to health care. Inclusion of common identifiers, however, would be ethical only if confidentiality were strictly maintained.

A final component of strategies to improve social class and other socioeconomic measures in US public health research and surveillance involves building scientific and public support for these data. Legislators, policy-makers, and scientific review panels will disburse funds for research and for adding socioeconomic data to existing public health data bases only if public health scholars and advocates mobilize compelling evidence and public sentiment in favor of increasing investment in data improvement at the federal, state, and local levels, and also in the private sector. The fact that the United States now leads the industrialized world in inequalities in income and wealth, coupled with growing economic instability among previously economically secure households and rapid dismantling and defunding of health and welfare programs for the poor, should make research on and monitoring of health disparities a top policy priority.

## CONCLUSION

Rapid changes in the US and global economies and increasing economic inequality among and across nations underscore the urgency of improving monitoring and analysis of socioeconomic inequalities in health within the United States and worldwide. Developing consistent and broadly comparable measures of social class and other aspects of socioeconomic position that can be incorporated into a wide variety of federally and privately sponsored data sets is essential.

The task of documenting and explaining social inequalities in health is a unique and defining responsibility of our field of public health. Absent adequate data on population patterns of health, disease, and well-being in relation to socioeconomic position, and as modified by social relations of race/ethnicity and gender, the public is deprived of knowledge essential to advance our collective welfare. Problems created by a lack of socioeconomic data in US public health data bases were apparent to Sydenstricker, Warren, and Trask in 1916, and these problems persist to this day. We encourage development of appropriate measures of social class and other aspects of socioeconomic position for public health research and surveillance, so as to generate knowledge useful for evaluating and redressing social inequalities in disease and death and monitoring steps towards social equity in health.

## APPENDIX

### *Examples of surveys with an array of socioeconomic and health measures*

National Health Interview Survey. Income, wealth and assets, occupation, education. Conducted annually, wealth module available 1993–96. All major racial/ethnic groups. Available from the National Center for Health Statistics, tel: (301) 436-7085 × 142.

National Health and Nutrition Examination Survey III. Income, occupation, education. Major racial/ethnic groups. Data collection 1988–94. Available from the National Center for Health Statistics, tel: (301) 436-7080 × 116.

National Health and Nutrition Examination Survey I Epidemiologic Follow-up Study. Income, occupation, education. Baseline and follow-up surveys 1971–1992. Diverse race groupings. Ethnicity: Hispanic only. Available from the National Center for Health Statistics, tel: (301) 436-5979 × 115.

Health and Retirement Study: Asset and Health Dynamics of the Oldest-Old. Income, wealth and assets, occupation, education. Multiple waves. Oversamples: Mexican-Americans, Blacks, Florida residents. Includes spousal (household) data. Available from Institute for Social Research, University of Michigan: <http://www.umich.edu/~hrswww/>.

Panel Study of Income Dynamics. Income, wealth and assets, occupation, education. Annual since 1968, follows family members and "offshoot" households. Geocoded and linked to Census, Medicare, and National Death Index files. Available from Institute for Social Research, University of Michigan: <http://www.umich.edu/~psid/>.

Wisconsin Longitudinal Study. Earnings histories (including parents of sample), socioeconomic indices, income, assets, occupation, schooling, inter-household transfers. Multiple waves 1957–1993 (siblings). Linked to partial Social Security earnings histories. Almost no racial/ethnic minorities (majority white). Available from [http://dpls.dacc.wisc.edu/WLS/wls\\_archive.html](http://dpls.dacc.wisc.edu/WLS/wls_archive.html).

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