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Socioeconomic Position

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The relationship between the socioeconomic position of individuals and populations and their health is well established—the socioeconomically better-off doing better on most measures of health status. Indeed, this direct association between socioeconomic position, measured in various ways, and health status has been recognized for centuries (Antonovsky 1967). In medieval Europe, for example, Paracelsus noted unusually high rates of disease in miners (1567). By the 19th century, systematic investigations were being conducted by Villermè into the relationship between rent levels of areas and mortality in Paris (Susser et al. 1985). In 1848, Virchow reported on the relationship between poor living conditions and typhus in Upper Silesia (Rather 1988). In England, Farr examined differences in mortality by occupation (Rosen 1993), while Engels (1848) deplored the impact of the new working conditions of the Industrial Revolution on the health of the poor in England.

These differences in morbidity and mortality between socioeconomic groups have

been observed in many studies and constitute one of the most consistent findings in epidemiologic research (Lynch et al. 1996, 1997c; Davey Smith et al. 1996; Sorlie et al. 1995; Link and Phelan 1995; Marmot et al. 1987). The general pattern of better health among those socioeconomically better off is found across time periods, demographic groups, most measures of health and disease, and various measures of socioeconomic position. This is not to say that relationships between socioeconomic factors and health are completely invariant or play out precisely the same way in all contexts. There are important political, cultural, and institutional factors that affect how socioeconomic conditions influence health (Kunitz 1994; Szreter 1997). Measures of socioeconomic position indicate particular structural locations within society. These structural positions are powerful determinants of the likelihood of health damaging exposures and of possessing particular health enhancing resources. This is perhaps the most basic principle in understanding how and why socioeconomic position is

linked to health. For instance, the reason that women travelling in Third Class on the Titanic were 20 times more likely to drown compared to women in First Class (Lord 1955), was due to the socioeconomic distribution of the health protective resources—in this case, the lifeboats.

In recent years there has been an explosion of interest in socioeconomic inequalities in health (Kaplan and Lynch 1997), and the evidence has been comprehensively reviewed in a number of places (Townsend and Davidson 1982; Syme and Berkman 1976; Kaplan et al. 1987; Haan et al. 1989; Williams 1990; Kaplan and Keil 1993; Feinstein 1993; Macintyre 1997; Carroll et al. 1996). Rather than duplicating the substance of these reviews, our aim in this chapter is to shed light on some subterranean conceptual and methodological issues that are not often discussed in the social epidemiologic literature on socioeconomic position and health and to suggest some directions that might guide future research.

Before proceeding we should say a word or two about terminology. We use the phrase "socioeconomic position" to mean the social and economic factors that influence what position(s) individuals and groups hold within the structure of society, i.e., what social and economic factors are the best indicators of location in the social structure that may have influences on health. A variety of other terms have been used in epidemiologic literature including social class, social stratification, social inequality, social status, and socioeconomic status (Krieger et al. 1997). To a large extent these terms reflect different historical, conceptual, and disciplinary roots. Our use of the term "socioeconomic position" incorporates features from many of these traditions.

Humans probably have always developed social structures that differentiate particular groups according to characteristics valued in their society. Similar observations from animal studies suggest that this may have a biological and evolutionary dimension (Manuck 1988; Sapolsky 1993). While our

understanding of the impact of socioeconomic position on health may benefit from such perspectives, it remains to be seen if this dimension will be any more than a minor adjunct to analyses of equity of resource allocation, social exclusion, and power relations, and how those factors play out in everyday life to influence the onset and progression of disease. From this perspective, we are less interested in the underlying phenomenon of hierarchy and its possible evolutionary roots than in the historical, cultural, and economic forces that shape the nature of the social hierarchies in which we live and their impact on life experiences and health.

We will briefly review some of the sociological traditions that shed light on social stratification. These provide a rich and diverse set of ideas which can inform our efforts to better understand the relations between socioeconomic position and health. One of the main aims of sociological research on stratification has been to identify and understand the principal lines of cleavage that structurally define society. While very little of this work was intended to directly inform understanding of the determinants of health, the structural fault lines that stratify societies according to socioeconomic position, race, ethnicity, and gender also turn out to be some of the most significant factors in determining patterns of population health. In general, sociologists are concerned with explaining the generation and reproduction of social stratification. Social epidemiologists, on the other hand, have been concerned with explaining its health consequences.

THE SOCIOLOGICAL BACKGROUND

In this section we will briefly discuss three major sociological traditions—Marxian, Weberian, and Functionalist—that have influenced the measurement and understanding of socioeconomic position in regard to health. At the risk of great oversimplification, we will argue that (1) the Marxian tradition presents a view of society stratified

into "classes" that are determined by the nature of exploitative production relations, (2) the Weberian tradition views society as stratified in multiple ways—by class, status and political power—and this stratification leads to the unequal distribution of economic resources and skills, and finally (3) the Functionalist tradition in U.S. sociology views the stratification of society as a natural and necessary feature of complex modern societies.

Karl Marx believed that an understanding of social class "reveals the innermost secret, the hidden basis, of the entire social structure" (1894, p. 791). For Marx, "class" was defined by the relationship to the means of production, or in other words, the relationship to productive resources (Wright 1985).

For Marx, social development resulted from the productive interaction of humans and nature. This productive activity was at the root of all societies and each system of production established particular social relations between individuals and the productive process. Capitalism is a system of commodity production in which people engage in a process which not only meets their needs and the needs of their immediate others but also is supposed to produce surplus commodities which can be exchanged in a market. Classes emerge from this set of social relations of production when a differentiated division of labor allows any accumulated surplus of production to be appropriated by a small number of people. These people then stand in exploitative relations to those whose labor produces the surplus. Under capitalism this exploitation is an inherently structural element of the capitalist system (Wright 1985). According to this view, domination and exploitation are not an inherent part of the human condition but are processes which arise from concrete features of the mode of production. Classes are constituted in the relationship between groups who own property in the means of production (factories, financial institutions, etc.) and those who do not. This yields a dichotomous model of class re-

lations, an exploiting "owning" class and a subordinate nonpropertied class who are of necessity in conflict. However, it is worth noting that this model was the pure type—a theoretical construct which would only be actualized in a fully bourgeois society.

The Marxian tradition has been carried forward by sociologists like Wright (1985, 1994) who have argued that the essence of class distinctions can be seen in the tensions of a middle class simultaneously exploiting and being exploited. It is a focus on the managerial functions of the middle class which leads to Wright's formulation—that the whole middle class is both exploited and exploiter. There is an inevitable tension in the middle class between those who act in the service of capital and those whose managerial activities are more closely aligned with the working class. This idea of "contradictory location" is not revealed by analyzing traditional occupational groups but by more sensitive differentiation of the particular mechanisms of exploitation evident in production relations. In its strictest interpretation, exploitation occurs through the social relations of production, but Wright argued that in practice, exploitation in contemporary capitalism is much more complex. He identified three forms of exploitation based on ownership of capital assets; control of organizational assets, and ownership of skill or credential assets. Control over these assets enables a particular group to appropriate surplus value and exclude those who might lay claim to this surplus. Wright's ideas have not been extensively tested in social epidemiology but do suggest a potentially fruitful avenue of social epidemiologic inquiry (Muntaner and Parsons 1996; Wohlfarth 1997; Muntaner et al. 1998).

In Weberian sociology, the focus was not on the structural relations imposed by capitalism; rather, the notion was that this system created groups, such as a working class, who were at a competitive disadvantage in the marketplace because they had fewer goods, abilities, and skills that they might exchange for income. Weber placed much

more emphasis on the role of individual social actors engaging in volitional activity in a competitive marketplace. Classes could be seen as groups of people who shared common sets of beliefs, values, and circumstances, or to use Weber's term, "life chances" (1958). Class position is not primarily determined by relations in production but by the free-market opportunities generated by these productive relations. Weber recognized the relationship to productive resources was important—not because it was inherently exploitative but because it influenced the distribution of economic opportunities, knowledge, assets, and skills with which individuals arrived in the market. Given a particular economic order, such as a capitalist system, class situation referred to the typical set of probabilities that a particular array of economic goods, living conditions, and personal life experiences were available to any group.

Weber altered the focus from the dynamics of exploitation in capitalist modes of production to the distributive aspects of how production relations generated different life chances in the marketplace. Marxian scholars have suggested that studying phenomena of distribution rather than of production is to examine the wrong level of reality (Poulantzas 1975). Furthermore, the inevitable realities of exploitative production relations impose systemic priorities and characteristics independent of the individuals who fill those roles. The idea that exploitative structural relations exist independent of individuals is consistent with epidemiological evidence that class-related health inequalities persist despite the fact that particular individuals come and go out of the various class groups over time.

Weber suggested that while there are clearly economic determinants to social stratification, any individual's fate—their life chances, should be understood in terms of the distributive forces of the market which were subject to social and political as well as economic power. In contrast to classes, groups defined by their social status were usually composed of communities of

people whose situation could be understood by their "social honor." Social honor was associated with a particular "style of life" which these communities shared and was not necessarily coincident with their economic circumstances. Weber suggested that not all power differentials could be understood by reference to purely economic distinctions. Weber's point was that there are other elements related to the distribution of power that lie in some sense of social privilege unaccounted for by the naked possession of wealth. While the status order and the purely functional order of class were not contingent upon one another, Weber recognized that having social honor and economic advantage produced more power than having social honor alone.

The Functionalist approach to social stratification that developed in the United States built on and altered aspects developed by Weber and to a lesser extent by Marx. The contributions made by Davis and Moore (1945), Warner (1960), and Parsons (1970) represented a "naturalist" conception of social stratification which has often been implicit in justifications for differences in health status between sectors of the society. In general, Functionalists argued that complex societies, of necessity, require stratification into sectors which are more or less valuable to the progress of that society. This rationale continues to be used as a reason to intervene or to not intervene in the health of some part of the social hierarchy. In fact, the implicit rationale for many public health interventions has been to ensure a healthy, functional workforce which would play its role in the accumulation of wealth and the progress of society as a whole.

While the Functionalists follow a more Weberian approach to social stratification, they share the Marxian view of the importance of structural features such as authority, position in the division of labor, and property relations in determining social position. Social stratification was related to a system of positions, not to the characteristics of individuals who occupied the posi-

tions. The primary driving forces of stratification were hardwired into the structure of a bureaucratically managed capitalist system so that the values, motives, and aspirations of the social actors involved were secondary in determining the nature of stratification.

However, in stark contrast to Marx, the Functionalist position implied a certain acquiescence over the existence of social inequality, so Davis and Moore (1945) argued meritocratically that social stratification was an unconsciously evolved device which ensured that those most qualified occupied the positions of power. While there are obvious weaknesses in this formulation it still forms one of the conceptual bases for contemporary arguments that social inequality is somehow the result of "natural" forces. Suffice it to say that this approach was, and continues to be used to legitimize the status quo. Warner demonstrated this orientation to social inequality by expressing hopes about how his book would be used:

The lives of many are destroyed because they do not understand the workings of social class. It is the hope of the authors that this book will provide a corrective instrument which will permit men and women better to evaluate their social situations and thereby better adapt themselves to social reality and fit their dreams and aspirations to what is possible. (1960, p. 5)

Even on the basis of these oversimplified positions, it should already be apparent that Marx was highly critical of capitalism as a system of social organization. In contrast, while Weber was not a champion of capitalism, his approach meant he was certainly not a critic of the system. Marx focused on how the social relations of capitalist production inevitably brought exploitation and conflict between the owners of the means of production and the workers who supplied the labor. Weber recognized the importance of production relations not because they exploited and alienated workers but because capitalist relations of production generated different sets of skills, knowledge, and assets that determined what Weber called an individual's "life chances" (1958). The issue

was not the hardwiring of exploitation in the capitalist system but the unequal distribution of "opportunity" produced by this system. This opportunity orientation implied that individuals could improve their market situation and life chances via strategies such as collective bargaining or obtaining more skills and knowledge.

It is this individualist Weberian focus that has led most epidemiological researchers to use indicators of "life chances" such as education, occupation, and income. The assumption here is that it is mechanisms linked to aspects of distribution that are most important for health—the skills, knowledge, and resources held by individuals that form the key linkage between social stratification and the health of those individuals. While Marx was deeply concerned with the human costs of exploitation, the locus of study was not individuals but the structural relations imposed by a capitalist economy. A Marxian approach focusing on exploitation as the link between socioeconomic position and health has not been well developed in social epidemiology but has been successfully applied in other disciplines (Boswell and Dixon 1993).

THE MEASUREMENT OF SOCIOECONOMIC POSITION

In Table 2-1 we have briefly described most of the major individual and area-level indicators of socioeconomic position that have been used in the epidemiologic literature. More extensive discussions of the details, potential advantages, and disadvantages of certain approaches to measurement have been presented in excellent reviews by Liberatos et al. (1988), Krieger et al. (1997), and Berkman and Macintyre (1997).

The measures of socioeconomic position presented in Table 2-1 reflect, to a greater or lesser degree, the Marxian, Weberian, or Functionalist schools of thought. Many of the measures in Table 2-1 are based on a Weberian framework concerned with measuring individual knowledge, credentials, skills, and assets. For instance, education,

Table 2-1. Compendium of individual and area-based measures of socioeconomic position

Individual-Level Measures	
<i>Occupation</i>	
Edwards—U.S. Census Classification (U.S. Census Bureau 1963; Haug 1977)	Categories of occupations that form the basis of the U.S. Census Classifications - basic scheme was devised on the conceptual distinction between manual and non-manual occupations. These types of scales exist for many countries
Registrar General's Classification—UK (Szreter 1984)	Categorization into 5 classes based on occupation
Occupational Grade (Rose and Marmot 1981)	Categorization of job types that reflects the occupational hierarchy within a specific working population, e.g., the Whitehall studies
Nam-Powers OSS (Nam and Powers 1983)	Continuous ranking of occupations based on average education and income of people in particular U.S. occupations—updated to 1980 Census
Nam-Powers SES (Nam and Terrie 1986)	Continuous score that includes the Nam-Powers OSS score plus education and family income—updated to 1980 Census
Duncan Socioeconomic Index—SEI (Duncan 1961)	Continuous score based on 45 occupational prestige rankings from U.S. National Opinion Polls. Income and education weights used to create scores for all occupations—updated to 1980 Census
Hollingshead (Hollingshead and Redlich 1958)	Continuous occupational prestige scale similar to Duncan SEI but could also be used as categorically as "social classes"—updated to 1970 Census
Siegel (Siegel 1971)	Continuous score based on occupational prestige rankings from U.S. National Opinion Polls—not updated past 1960 Census; males only
Warner—Index of Status Characteristics (Miller 1983)	Continuous score that combines information on occupation, source of income, housing type and area of residence—based on information from the 1940s
Erikson Goldthorpe—EGP (Erikson and Goldthorpe 1992; Kunst et al. 1998)	Clustering of occupational titles into 7 categories. Intended to be used in cross-national comparisons
Treiman (Treiman 1977)	Based on occupational prestige rankings from a number of countries. Designed to allow cross-country comparisons—males only
Wright's Social Class Scheme (Wright 1985, 1996; Wohlfarth 1997; Muntaner et al., 1998)	Categorization based on occupational hierarchy of managers, supervisors, and workers, plus information on supervision of other workers, and control over decision making
Unemployment (Bartley 1994)	Categorization based on exclusion from the workforce
<i>Income</i>	
Self-reported Income (Backlund et al. 1996)	Continuous or categorical self-reports of income at the personal, family, or household level. Income definition is also important in regard to whether income is gross or net of taxes and transfers, or "disposable." It is also possible in some cases to gain access to administrative records such as the IRS or Social Security to get income information
Income in Relation to Poverty Level (Lynch et al. 1997c)	Categorization of income as a percentage of the official poverty-level income for a specific year, e.g., above and below 200% of the poverty level income

(continued)

Table 2-1.—Continued

<i>Education</i>	
Self-reported Education (Feldman et al. 1989; Elo and Preston 1996)	Continuous information collected from self-reports of total number of years of education, or categorically as attainment of particular educational milestones such as completing high school
<i>Wealth</i>	
Total Assets (Smith and Kington 1997; Muntaner et al., 1998)	Continuous measure of the value of housing, cars, investments, inheritance, pension rights, liquid vs. nonliquid assets
<i>Population-specific scales</i> (Dye and Lee 1994)	Developed for specific contexts where other measures may not be applicable. e.g., in remote Kashmiri villages the number of cows and sheep indicates control of valued resources
<i>Area-Based Measures*</i>	
Occupational Structure (Wing et al. 1992; Armstrong and Castorina 1998)	Information on % white collar employment; % unemployed; average wage in manufacturing or other economic sectors; % unionized workforce
Educational Structure (Morris et al. 1996)	Information on % college graduates; % high school graduates; % with less than primary education; average reading and math scores
Economic Structure (Kaplan et al. 1996; Lynch et al. 1998; Jargowsky 1996)	Information on income distribution; average income, "economic segregation"; % in poverty; housing values; home ownership; car ownership; % welfare and other government assistance; % children in single-headed households; source of income; mortgage as % income
Economic Exploitation (Boswell and Dixon 1993)	Ratio of value added to wages in certain sectors of the economy
Housing Characteristics (Koopman et al. 1991; Polednak 1997)	Information on age of construction; vector infestation; population density per room; access to plumbing; kitchen; telephone; water; sewerage; residential segregation
Resource Base (Troutt 1993)	Information on the number of supermarkets, liquor outlets, parks, playgrounds, medical facilities, banks and other public and private services
Poverty Area—U.S. (Haan et al. 1987)	More than 20% households below poverty-level income
Material Hardship—U.S. (Mayer and Jencks 1989)	Combines information on unmet needs for food, housing and medical care
Deprivation Area—UK (Townsend et al. 1988; Eames et al. 1993; Carstairs 1995)	Combines information on unemployment, car and home ownership, overcrowding, etc.

* Many of these are Census-derived measures and can be gathered from other administrative and private sources.

income, wealth, and to a lesser extent the occupational classifications are all indicators of what resources individuals hold and what sort of "life chances" they have. The occupational prestige scales are more related to the Functionalist tradition. Only Wright's (1985) formulation and the area measure of exploitation rate attempt to directly tap the Marxian understanding of so-

cioeconomic position. In theory, the choice of measure of socioeconomic position should depend on how you believe socioeconomic position is linked to health damaging exposures and health protective resources and ultimately to health. Is it exploitation, few tangible resources, or lack of prestige that causes poor health, or some combination of these? In any event, claims

that one measure is universally better than another are conceptually and methodologically unhelpful (Winkleby et al. 1992), if for no other reason than some measures may more adequately represent exposure to poor socioeconomic conditions at different stages of the lifecourse than others (Davey Smith et al. 1998a,b).

The area-based measures in Table 2-1 can be seen largely as aggregate correlates of the individual measures. In practice, however, it is important to distinguish whether a particular measure is meant as a proxy for individual characteristics or whether it is meant to actually characterize a certain quality of the area itself (Geronimus and Bound 1998; Diez-Roux 1998). For instance, in studies at the individual level when information is not available about a characteristic of interest (such as income) geocoding can be used to assign average aggregate levels of that characteristic to individuals, because the average income at a particular level of aggregation such as the block group or census tract is known from Census data. In this case, area measures are used as proxies for missing information on individuals. Area measures can also be used to assess "contextual" socioeconomic effects. In this case, the area measure actually represents an important aspect of exposure to certain socioeconomic conditions (Haan et al. 1987; Davey Smith and Dorling 1996). In other words, the percentage of unemployment in an area not only indicates something about the individuals who live there (the composition of the area); it may also provide other information about the area that conditions the health risks of all those who live in the area—not just the unemployed individuals: That is, the area characteristics may have a contextual effect on individual health.

One other issue related to measurement concerns how the relationship between a particular indicator of socioeconomic position and a health outcome is expressed. In other words, once a measure of socioeconomic position has been chosen, how should the "size" of the socioeconomic

health inequality be assessed? The most common approach in social epidemiology has been to express socioeconomic health differences as rate ratios of extreme socioeconomic groups. Results of studies are usually reported like this—compared to those with a university degree people with less than primary education had threefold increased risk of some health outcome. This approach is useful in expressing the relative health disadvantage in one particular socioeconomic group compared to another but it ignores the relationship in the rest of the population. In addition, rate ratios do not necessarily elucidate the public health importance of the socioeconomic health inequality in terms of the size of the exposed population, or the absolute level of risk (Pamuk 1985). These issues are very important for research that compares the size of socioeconomic health inequalities over time and among populations. Discussions of these issues have been presented by Wagstaff et al. (1991) and Mackenbach and Kunst (1997).

SOCIOECONOMIC POSITION AND HEALTH—THE ELEMENTS OF A FRAMEWORK

Our purpose has not been to adjudicate the relative worth of any particular sociological approach to understanding socioeconomic position. Rather, we think this overview suggests some important themes that can provide a general framework for understanding and measuring the association between socioeconomic position and health. Our view of how to understand socioeconomic position in the context of its relationship to health is what Wright (1996) has described as a "hybrid" Marxian-Weberian view. Its elements are:

1. The social and structural relations between groups in any particular society have a broadly defined material basis that is determined by productive relations to the economy. These relations are characterized by the effective control of resources and exercise of this control exploits, dominates,

alienates, and excludes other less advantaged groups.

2. The inevitable realities of exploitative production relations impose a set of systemic priorities and characteristics independent of the individuals who fill those roles. Thus, socioeconomic position, while observable in individuals, should also be conceptualized as extraindividual.

3. It is also clear that productive relations are important in determining lifestyles and are reflected in the socioeconomic patterning of risk factors, health behaviors, and psychosocial attributes (Lynch et al. 1997b). Far from being a surprise to Marx, Weber, and others in these sociological traditions, evidence that socioeconomic position is related to behavior, psychological states, and lifestyle would be a corollary. These individual behavioral and psychosocial characteristics can be considered the embodiments of particular structural locations in society. Bourdieu (1984) has demonstrated in exquisite detail how position in the social hierarchy is consistently related to almost every aspect of life from home decor, to taste in music and food, to opinions on art and desirable vacations, let alone dietary, exercise, and other behaviors. The imperatives and constraints of the structural dimensions of life are compelling and have important implications for how members of social groups are able to conduct their lives in other contexts.

4. It follows from this general formulation that the effective control of material, economic, social, political, symbolic, and cultural resources is differentially distributed within any society, so those who are exploited, dominated, or excluded have less resources and less control over them. Similarly, if exploitation, exclusion, and domination are basic facts of life in modern economies, then the negative exposures and demands which these exploited, excluded, and dominated groups face may be accompanied by inadequate resources which can be brought to bear.

We think that this type of general framework of health damaging exposures, de-

mands and health protective resources is useful in understanding relationships between socioeconomic position and health (Kaplan et al. 1987; Haan et al. 1989). The ways in which exposures and resources act, interact and are manifested in different contexts and at different stages of the lifecourse are important determinants of population health. An exposure-resources framework that is grounded in understanding how powerful economic and social forces are important determinants of position in the social structure may afford us some fresh interpretations of the already-voluminous literature on the association between socioeconomic position and health. More importantly for the present chapter, it suggests how we might advance our concepts and measures of socioeconomic position to include a broader range of exposures and resources that operate across the lifecourse. We severely limit our understanding of the socioeconomic patterns in adult health if we ignore consideration of how exposures and resources may cascade and accumulate over the lifecourse to effect adult health status (Geronimus 1992; Vågerö and Illsley 1995; Lundberg 1997; Lynch et al. 1997b; Davey Smith et al. 1997, 1998a; Kuh and Ben-Shlomo 1997).

BEYOND EDUCATION, OCCUPATION, AND INCOME

Interpretation of sociological theory implies that the stratification of society into classes or groups can be conceived as involving materially related economic, political, symbolic, psychosocial, and behavioral factors. These factors are related to the exercise of power in alienating, excluding, exploiting, and subordinating others. In regard to this theoretical conceptualization, the traditional individual measures of socioeconomic position—education, income, and occupation—perhaps can be seen as relatively limited indicators of the social and economic forces that dominate the social structure. It is striking that even with these limited indicators, the large amount of epidemiologic

evidence showing the importance of these factors as health determinants should be so strong and consistent. In this section we will briefly discuss some of the strengths and weaknesses of the traditional educational, income, and occupational measures of socioeconomic position and suggest some directions for future research. It is worth reiterating that these measures of socioeconomic position bear the Weberian signature, in that they are individually specified. In social epidemiology, this may have helped us lose focus on more structural determinants of these individual characteristics. Even as we use individual-level indicators we should keep in mind that they are derived from larger social and economic processes that shape the distribution of education, occupation, and income across the population.

Level of education is an important marker of socioeconomic position that is usually measured at one key point in the life-course—the transition from childhood and adolescence into adulthood and exposure to the world of work. In a lifecourse perspective, it represents the transition from a socioeconomic position largely received from parents to an achieved socioeconomic position as an adult, although educational opportunities may reflect parental socioeconomic position. It is a useful indicator if for no other reason than it is generally available for both sexes, excludes few members of the population, and is less subject to negative adult health selection, although it is possible that childhood afflictions associated with low socioeconomic position may impact later educational attainment. Education may be particularly salient in less economically developed countries. In these countries the educational levels of women have been consistently demonstrated to be important determinants of population health (Desai and Alva 1989). Exposure to formal education involves gathering facts, learning concepts, and finding out how to access information. It may provide a set of cognitive resources that have broad potential to influence health.

In addition, educational success also pro-

vides information about likelihood of future success. Higher levels of education generally are predictive of better jobs; higher incomes; and better housing, neighborhood, and working conditions. However, economic returns on education may differ markedly across racial, ethnic, and gender groups. Women and minorities realize lower economic returns for the same investment in their education than do white men (Oliver and Shapiro 1995). In addition to its strictly material value, educational success also has an important social dimension—it has socially symbolic as well as material value. A college degree granted from a prestigious university has different social and symbolic value than the same college degree gained from a less prestigious institution.

In using education as a measure of socioeconomic position we should also understand some of its potential limitations. Knowing the number of years of education tells us nothing about the quality of that education or how it is socially and economically valued. Measures of years of education also do not acknowledge the importance of the credentials that are achieved with the attainment of particular educational milestones. Educational achievement has had different social meanings and consequences at different time periods and in different cultures. Receiving less than a primary school education may have very different consequences in a society which is economically stagnant compared to one where the overall economy is booming and many opportunities exist for well-paid employment and upward social mobility. In the latter kind of society, level of education may be a poorer predictor of later material and economic well-being (Lynch et al. 1994).

Our point here is that information about the number of years or the achieved level of education fails to directly reveal much of what might be important about education in terms of its relationship with health. Without knowledge of the cognitive, material, social, and psychological resources gained through education, and accumulated over the lifecourse, we cannot hope to

make much sense of the association between educational experience and health, nor address important intervention questions.

Another important measure of socioeconomic position is occupation. Concern about the health consequences of employment in particular working environments has had a long history. Work in mines, cotton mills, and the factories of the early Industrial Revolution was linked to a variety of poor health outcomes (Paracelsus 1567; Villerme 1840; Engels 1848; Farr 1864). Since then many studies have examined not just how poor working conditions in particular industries have affected health but also how systematic health differences exist between broadly classified occupational groups such as white and blue collar workers despite important heterogeneity in working conditions and income within these occupational groupings (Mackenbach et al. 1997). Understanding the association between work and health is crucial because it is the most obvious, intimate, and stable connection between humans and the productive processes that dominate much of our adult lives. Work is the major structural link between education and income. In broad terms, educational experiences are important in determining what sorts of employment are available, and this employment then determines the amount of economic return. We cannot understand socioeconomic stratification or its health consequences without understanding how work or the lack of work structures people's lives. This is not to say that understanding the structural positions of women not engaged in formal employment or individuals out of work should be ignored, but it is to say that we need more sophisticated occupational classification schemes that can include these groups. Such schemes should also allow consideration of the dual structural burden for women who are not only formally employed but also hold other structural social roles, such as caregiving (Arber 1987, 1991).

Perhaps more than is the case for educa-

tion and income, studies of occupation and health have explored the multiple pathways through which work affects health. Many occupations require working in hazardous environments where exposure to chemicals, radiation, biological hazards, physical stress, noise, heat, unsafe conditions, cold, dust, and other pollutants are an inherent feature of work. These sorts of working environments are more common for those with less education. In addition to this focus on the physical environment, there has been a good deal of attention paid to the psychosocial environment of work. The work of Karasek and Theorell (1990) has been very influential in demonstrating the impact of the psychosocial work environment on health, with a focus on hypertension and cardiovascular disease. They have suggested that psychological demands, decision latitude, and social support at work form the three major dimensions relevant to understanding how the psychosocial work environment affects health. Studies using this model have shown that conditions of high psychological demand with low decision latitude and low social support are often related to the poorest health outcomes (Schnall and Landsbergis 1994).

In some ways, the demand-control approach to understanding the association between work and health is similar to what we have proposed as a more generalized exposure-resources model. However, the generalized exposure-resources framework suggested here is grounded in an attempt to understand how structural factors determine the distribution of working conditions across the population. Particular jobs with high psychological demands, low decision latitude, and poor workplace social support have to be seen as arising from the economic, political, historical, and sociocultural imperatives that define processes of production. In contrast, while the demand-control model has been useful in improving understanding of the association between work and health, it has been limited by interpretation within an individualistic psychosocial framework (Muntaner and O'Campo

1993). This orientation has led many researchers to examine the effects of psychosocial work conditions on health adjusted for measures of socioeconomic position such as income, education, and occupation and to claims that the adverse health effects of high demands and low control are "independent" of socioeconomic position (Karasek and Theorell 1990; Schnall and Landsbergis 1994). For both methodological and conceptual reasons we do not believe that there is much to be gained from statistically partitioning the separate contributions of socioeconomic position and psychosocial working conditions (Lynch et al. 1997d,e; Marmot et al. 1997; Davey Smith and Harding 1997). In reality they are intimately related in complex ways that may be trivialized by the crude statistical adjustment of one for the other. "Explaining" social-level phenomena such as socioeconomic gradients in health cannot be reduced to "explaining away" these gradients by statistical adjustment for workplace demands and control at the individual level—the demand-control attributes assigned to individuals are in large part a result of the social-level phenomena being explained (Macintyre 1997). Furthermore, such explanations are not even relevant for understanding socioeconomic health gradients among those who are not working.

It seems likely that we must reintegrate studies of psychosocial workplace factors and health within the broader context of an understanding of how socioeconomic position, understood as an extraindividual social-level factor, influences health. Siegrist and colleagues have developed an effort-reward model of job stress that explicitly examines how high effort conditions (characterized by high job demands and psychological immersion in work) are balanced against the economic, social, and promotional rewards of work (Siegrist et al. 1990; Siegrist 1996). While largely conceptualized within an individualist psychosocial framework, this approach extends the demand-control model to include nonwork factors and consideration of the income and other

rewards derived from work. Consistent with this model, we have shown that high levels of workplace demands combined with low economic returns from work are associated with greater progression of carotid atherosclerosis and higher rates of myocardial infarction and mortality (Lynch et al. 1997d,e).

Income is a useful measure of socioeconomic position because it relates directly to the material conditions that may influence health. It is likely that there is nothing about the possession of money per se that is likely to affect health; rather, income level has influences on health because of what money can buy. Adequate income has important implications for a range of material circumstances that have direct implications for health; quality, type, and location of housing; food; clothing; transportation; medical care; opportunities for cultural, recreational, and physical activities; child care; and exposure to an array of environmental toxins. While increasing income is likely to produce diminishing returns on the health impact of these material conditions, it is nevertheless important to remember that differences in health-related material conditions exist across all levels of income.

The influence of "material conditions" on health is usually understood within the framework of the sanitary approach to public health that arose in response to 19th-century industrial society. In this view, which was entirely appropriate for the times, improved material conditions involved adequate housing, avoidance of hunger, safe water supply, and the reduction of environmental hazards through waste removal and treatment. The focus was on changing the material conditions associated with poverty. There is no doubt that providing the most basic of decent material conditions remains salient in much of the world and within many industrial countries, especially the United States. In 1994, 38 million Americans lived in poverty, 15 million of whom were under 18 years of age, and 6 million were preschoolers under the age of 6 (Corcoran and Chaudry 1997). These depressing

statistics serve to illustrate that the 19th-century understanding of adequate material conditions remains highly relevant to the modern world.

However, we must add a "neo-material" interpretation to this view. There is a graded relationship between income and health that is not limited to the wrenching problems of poverty. Supplying clean water, shelter, adequate calories, and waste removal were important for socioeconomic differences in life expectancy in the middle of the 19th century. These were the basic material conditions relevant to understanding health inequalities within a context of relatively low life expectancies of 45 years for professionals, 26 years for skilled manual workers, and 16 years for laborers (Antonovsky 1967). In the late 20th century, social epidemiologists are trying to understand socioeconomic differences in life expectancy in a context where the average length of life in 1995 has increased to 75.8 years (National Center for Health Statistics 1998). The material basis of these socioeconomic health differences has changed. We need to consider the neo-material conditions that might be relevant to understanding socioeconomic health differences within the context of the historical overall improvement in health. For instance, adequate nutrition in terms of calories is not the same as having a balanced, low-fat diet, rich in fresh fruit, grains, and vegetables. Adequate housing is not the same as housing that can protect people from extremes of heat and cold and overcrowding. Even if the most basic material conditions are satisfied through a low but adequate level of income, each step up the income ladder may bring added neo-material benefits that can produce gains in health. Davey Smith et al. (1990), Macintyre et al. (1998), and Blane et al. (1997) provide evidence that health and mortality are sensitive to fine gradations of neo-material conditions, as evidenced through access to cars, home ownership, having a home with a garden, and healthier food. Furthermore, better neo-material conditions may have immediate and cumulative

benefits over the lifecourse and may also influence the socioeconomic position and health status of future generations. Children who have access to a home computer may be improving the likelihood of later educational success and so influence their subsequent socioeconomic position and health.

Neo-material conditions are intimately tied to psychological states, health behaviors, and social circumstances that also influence health. In a study in Finland, we showed that men who worked in low-paid employment were the most materially disadvantaged, had higher job and financial insecurity, and experienced more unemployment and work injury. It is not coincidental that these were the same men who tended to smoke more, exercise less, eat less nutritious diets, get drunk more often, have a cynically hostile outlook, and not feel full of hope about the future (Lynch et al. 1997b; Lynch, in press). One approach has conceptualized the psychosocial and behavioral correlates of low income as maladaptive phenomena that are amenable to cognitive, emotional, and behavioral modification. While they may be maladaptive in terms of health and longevity, within the generalized framework of socioeconomic position that we have developed here, these psychosocial states and health behaviors must be viewed as responses to adverse conditions imposed by broader social and economic structures (Evans et al. 1994). These two approaches to understanding health behaviors and psychosocial attributes have vastly different implications for intervention.

Adequate income provides a generalized resource that provides access to a larger variety and better quality of neo-material goods and conditions. It also provides ready access to the skills and labor of others. Disposable income can provide a buffer from many of the stresses of daily life through, for example, just having the ability to easily fix something as random as a flat tire. However, most sources of social and environmental stress are not randomly allocated among the population. It is precisely those groups with the least disposable income who are

subject to the largest cumulative burden of stressors (McLeod and Kessler 1990; Ross and Wu 1996; Turner et al. 1995). Interestingly, this cumulative, over-the-lifecourse burden of stress may have far-reaching physiologic consequences (McEwen 1998).

One potential limitation of studies that have examined income and health is that almost all of them have measured income at one only point in adulthood. There is little doubt that this strategy fails to fully capture the health effects of sustained exposure to low income or to account for transitions into and out of low-income groups; nor does it allow for the dynamic interrelationship of health and income. There is considerable volatility in income over the lifecourse, with between 26% and 39% of individuals in the United States, aged 45 to 65 years experiencing income reductions of 50% or more at least once in an 11-year period (Duncan 1996). These rises and falls in income are more pronounced for those at the bottom of the income distribution because they are less likely to have stable employment (McDonough et al. 1997). The first step in improving our understanding of the relationship between income and health is to better assess the exposure to varying income conditions by measuring income at multiple points in time. The utility of this approach can be seen in our 29-year study of economic hardship and functioning (Lynch et al. 1997c). By measuring income in 1965, 1974, and 1983 we were then able to examine the cumulative effects of sustained economic hardship on physical, psychological, cognitive, and social functioning in 1994. The results of this study showed strong dose-response associations between the number of periods of economic hardship and physical, psychological, and cognitive functioning. In addition, because we had multiple measures of income, we were able to examine the potential for reverse causation to explain our results. Reverse causation, or the fact that illness may cause lower incomes instead of the other way round, has been proposed as an important competing hypothesis for studies that have

related income to health (Smith 1999). The most powerful examinations of the direction of potential causation can only arise when income and health data are measured at multiple time points. In an analysis of administrative data from the Canadian Pension Plan, Wolfson and colleagues (1993) used 10–20-year earnings histories to show that men whose incomes had steadily increased but who still remained in the lowest income group had higher mortality than more economically advantaged men. This approach convincingly demonstrated how reverse causation could not explain their findings. Investigations like these, which use multiple measures of health and income, will expand our understanding of the complex relationship between income and health.

There is another aspect of the income-health relationship that should be mentioned in terms of moving this field forward and that concerns issues of wealth. As we have suggested, if income can be thought of as a generalized resource that provides access to better neo-material conditions and can be used to buffer the effects of social and environmental stress, then it is possible that accumulated assets or wealth could further expand this resource. Several studies have suggested that the strength of the relationship between income and health declines after age 65 (Kaplan et al. 1987; House et al. 1994). This could reflect a true underlying trend, or it may be that after age 65 income is a less sensitive measure of socioeconomic position. This issue can be examined as information on income, wealth, and health becomes available through such studies as the Health and Retirement Study (HRS), Asset and Health Dynamics Among the Oldest Old (AHEAD) and the Panel Study of Income Dynamics (PSID). These longitudinal studies have information, detailed in some cases, on income, wealth, job histories, and health that will allow examinations of the dynamic interplay of these factors. Cross-sectional analysis of the first wave of the HRS study suggests that both income and wealth may make statistically

separate contributions to health status (Kington and Smith 1997; Muntaner et al. 1998).

Households that have equivalent income levels may differ markedly in terms of their accumulated assets. This is most evident for comparisons across racial and ethnic groups. Race differences in wealth are much larger than income differences. Using data from the HRS study, Smith (1995) has shown how African-American and Hispanic households have far less wealth at every level of income. On average, for every one dollar of wealth of a middle-aged white household, an African-American household has 27 cents. Even for households with incomes that are in the top quintile, African-American households have 56% less net worth, and Hispanics households 67% less net worth, than white households. In low-income households the picture is even more stark. In the lowest income quintile, African-American and Hispanic households have 85% and 63% less net worth, respectively. The information that is used to calculate these figures for net worth includes housing equity. If we understand the relationship between wealth and health as in part reflecting the ability to respond to and buffer social and economic stress by calling on savings, then the role of liquid assets might be even more important than nonliquid assets such as a house. Decomposing the HRS wealth data shows that the median level of financial assets in white households is \$17,300, but it is \$400 in African-American households and only \$78 in Hispanic households (Smith 1995). For all intents and purposes the average African-American and Hispanic households have no liquid monetary reserves at their disposal.

These data highlight how much can be hidden by only examining income levels. If wealth has an important role to play, then using income as a measure of socioeconomic position may underestimate the true differences in health. Perhaps, more importantly, studies that are not interested in socioeconomic effects per se normally adjust the association of interest with mea-

asures like income. The residual effect can then be claimed to be "independent" of socioeconomic position. However, the data on the distribution of wealth suggest that adjustment for income may be an inadequate representation of the true underlying socioeconomic differences. This is especially crucial for studies that seek to examine racial health differences adjusted for socioeconomic position. Adjustment for income in a study of African-American vs. white health differences clearly underestimates the true effect of socioeconomic factors. In fact, there are multiple socioeconomic differences between African-Americans and whites that are not captured in simple variables like education or income (Krieger et al. 1993; Krieger 1994). Kaufman et al. have shown how inadequate adjustment for socioeconomic factors can produce spurious results that favor the interpretation of residual racial health differences. They argued that "The social distinction between blacks and whites is multidimensional and cannot be captured fully in a scalar such as education or reported income" (Kaufman et al. 1997, p. 627).

While these traditional measures of education, occupation, and income are powerful predictors of health, they are limited. We must transform our thinking and analysis from static to dynamic approaches to more fully understand how socioeconomic factors influence health. This means conceptualizing, gathering, and analyzing data within a lifecourse perspective (Lynch et al. 1997b; Kaplan and Lynch 1997; Davey Smith et al. 1997; Power et al. 1997; Kuh and Ben-Shlomo 1997; Davey Smith et al. 1998a).

From such a perspective, observations of income or occupational health differences in adulthood would be seen to be the result of intertwining chains of biological and social factors operating over the course of life to influence adult health status. Figure 2-1 illustrates how some selected aspects of socioeconomic position can influence health at various stages of the lifecourse. The particular outcome depicted here is cardiovas-

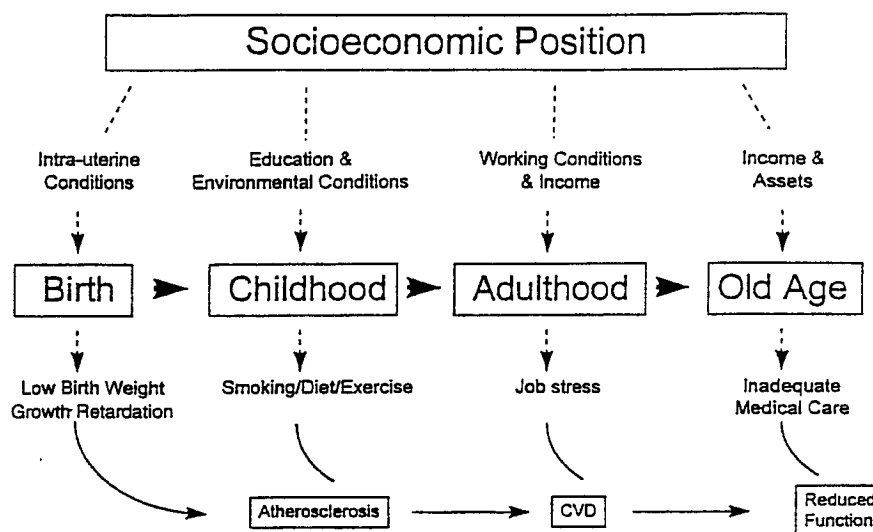


Figure 2-1. Socioeconomic influences on cardiovascular disease from a lifecourse perspective.

cular disease but similar links could be drawn for many conditions. From the very start of life the socioeconomic position of parents influences intrauterine conditions. This process can be understood as the intergenerational transmission of socioeconomic position through a stock of "health resources" that are passed on to the developing fetus. The later importance of these processes in regard to adult health is not entirely clear, but there has been a good deal of evidence relating low birth weight and other markers of suboptimal intrauterine environment and adult cardiovascular disease (Barker and Osmond 1986; Barker et al. 1989; Barker and Martyn 1992). During childhood, socioeconomic position of parents (such as income, type of housing, neighborhood) influences the types of environments in which children grow, learn, and begin to adopt a range of behaviors that can influence the early development of atherosclerosis. In adulthood, working conditions and income level affect job stress and have direct implications for the onset and progression of cardiovascular disease, while at older ages, income and assets impact the quality and availability of medical and

support care. All of these processes may contribute to what is observed as adult socioeconomic differences in cardiovascular disease (Lynch et al. 1997a). Future studies will need to examine the complex temporal interactions between the genetic and biological attributes that are endowed early in life, and the social, economic, and political environments which determine the accumulation and distribution of exposures and resources over the lifecourse and ultimately shape patterns of adult health.

SOCIOECONOMIC POSITION OF NEIGHBORHOODS AND COMMUNITIES

The previous discussion has focused on the socioeconomic position of individuals and groups. The focus on the individual is often seen as the logical place to start. After all, individuals have incomes and wealth, they acquire an education, and they practice particular jobs. Furthermore, the health effects of socioeconomic position on populations must ultimately be understandable in terms of biologic processes occurring at the individual level. Lacking individual measures of

socioeconomic position, many studies have examined the association between area or community-based measures of socioeconomic position and the health of populations living in those areas (e.g. Townsend et al. 1988; Eames et al. 1993). The units of analyses have often been based on administrative definitions—for example, census blocks and tracts, postal codes, metropolitan statistical areas, states, and countries. The measures include median or per capita income, deprivation scores, percent in poverty, unemployment, median level of education, percent white collar occupations, and unemployment rate (Table 2-1). Generally, such analyses show strong, graded associations between these measures and most health outcomes, mimicking the associations seen at the individual or group level. These analyses have often proceeded as if the measurement of socioeconomic position at the ecologic or area level was simply a proxy for measurement at the individual level. An alternative view is that differences in the socioeconomic position of communities or areas reflect more than different distributions of individuals with specific characteristics in these areas (Haan et al. 1989; Kaplan 1996; Schwartz 1994). This view calls upon the exposure-resource model presented above, describing the distribution of resources and exposures at the community or area level. Thus, extraindividual socioeconomic factors closely related to the physical and social infrastructure of communities are thought to affect health above and beyond individual compositional aspects (Kaplan et al. 1987; Haan et al. 1989; Wing et al. 1988; Macintyre et al. 1993; Krieger 1991).

A growing amount of literature supports such a view (Kaplan 1996; Diez-Roux et al. 1997; Diez-Roux 1998; O'Campo et al. 1995, 1997; Robert 1998). One of the first studies to show an independent effect of community-level variables on health indicated that, in participants in the Alameda County Study, residence in a poverty area was associated with an approximately 50% increased nine-year risk of death, even when

a large number of measures of individual status were taken into account statistically (Haan et al. 1987). The independent role of area effects is also shown in other studies which have used nationally representative samples (Anderson et al. 1997; Robert 1998). Finally, recent work indicating an association between mortality and life expectancy and the unequal distribution of income in areas, a variable which can only be measured at the community or aggregate level, lends further credence to the importance of extraindividual, aggregate measures of socioeconomic position (Kaplan et al. 1996; Kennedy et al. 1996; Wilkinson 1996; Lynch and Kaplan 1997; Daly et al. 1998; Lynch et al. 1998).

This emphasis on the importance of community or area characteristics that are by definition extraindividual is seen in a number of other areas of research. Criminologists (Sampson 1992; Sampson et al. 1997), researchers studying child development (Brooks-Gunn et al. 1997), and those interested in the plight of the disadvantaged (Wilson 1987) have all turned to a consideration of the structure, organization and function of communities. The exposure and demands model seems to characterize many of the factors within communities that may be associated with poorer health (Kaplan 1996).

CONCLUSIONS

There can be no doubt that the socioeconomic position of individuals, groups, and places is a defining characteristic of their levels of health and disease. While it is important to keep in mind the salience of socioeconomic position in determining the health status of individuals and populations, advancing our understanding of the reasons for these effects and their policy implications requires more than simply pointing to the association. We argue that several steps are necessary to advance epidemiologic studies in this area (Kaplan and Lynch 1997). In addition to an increased recognition of the intellectual foundations of mea-

asures of socioeconomic position, greater effort must be devoted to an attempt to understand what these measures are proxies for. This means, for example, a better specification of how exploitation, education, or income level could be related to health and health trajectories. Such a specification will, undoubtedly, be best informed by an analytic and conceptual view which incorporates a dynamic and life course perspective, in some cases one that is intergenerational. Within this perspective, new research should attempt to explicate what we have called the "epidemiology of everyday life." That is, how are daily experiences, and their cumulative trajectories, stratified according to socioeconomic position over the entire lifecourse? We are just beginning to see the critical nature and function of extraindividual factors such as institutions and communities as important agents in the socioeconomic stratification of the health of individuals and populations, and this work needs to be vigorously pursued. Finally, the role of macroeconomic factors cannot be ignored. Economic policy and social policy have much to do with the levels of resources and exposures that individuals and communities experience; they represent important loci for intervention and are the upstream determinants of public health.

The exposure and resources model, rooted in the intellectual traditions of the analysis of social class and stratification, is an overall organizing scheme for furthering the research agenda indicated above that may have heuristic value. At both the individual and community level it is possible to describe the levels, balance, determinants, and consequences of resources and exposures. What's more, such a conceptualization may relate well to recent work on the downstream, mediating pathways that link socioeconomic position to the health of individuals. This view may be useful in the evolution of a social epidemiologic approach to socioeconomic inequalities in health that strikes a balance between proximate and mechanistic approaches to disease causation in individuals and upstream,

global approaches to the health of populations.

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REFERENCES

- Anderson, R., Sorlie, P., Backlund, E., Johnson, N., and Kaplan, G.A. (1997). Mortality effects of community socioeconomic status. *Epidemiology*, 8:42-7.
- Antonovsky, A. (1967). Social class, life expectancy and overall mortality. *Milbank Mem Fund Q*, 45:31-73.
- Arber, S. (1987). Social class, non-employment and chronic illness: continuing the inequalities in health debate. *BMJ*, 294:1069-73.
- Arber, S. (1991). Class, paid employment and family roles: making sense of structural disadvantage, gender and health status. *Soc Sci Med*, 32:425-36.
- Armstrong, D.L., and Castorina, J. (1998). Community occupational structure, basic services and coronary mortality in Washington state, 1980-1994. *Ann Epidemiol*, 8:370-7.
- Backlund, E., Sorlie, P.D., and Johnson, N.J. (1996). The shape of the relationship between income and mortality in the United States: evidence from the National Longitudinal Mortality Study. *Ann Epidemiol*, 6: 1-9.
- Barker, D.J., and Martyn, C.N. (1992). The maternal and fetal origins of cardiovascular disease. *J Epidemiol Community Health*, 46: 8-11.
- Barker, D.J., and Osmond, C. (1986). Infant mortality, childhood nutrition, and ischaemic heart disease in England and Wales. *Lancet*, 1:1077-81.
- Barker, D.J., Osmond, C., Golding, J., Kuh, D., and Wadsworth, M.E. (1989). Growth in utero, blood pressure in childhood and adult life, and mortality from cardiovascular disease. *BMJ*, 298:564-7.
- Bartley, M. (1994). Unemployment and ill health: understanding the relationship. *J Epidemiol Community Health*, 48:333-7.
- Berkman, L.F., and Macintyre, S. (1997). The measurement of social class in health studies: old measures and new formulations. In Kogevinas, M., Pearce, N., Susser, M., and Boffetta, P. (eds.), *Social inequalities and cancer*.

- Lyon, France: International Agency for Research on Cancer, pp. 51-64.
- Blane, D., Bartley, M., and Davey Smith, G. (1997). Disease aetiology and materialist explanations of socioeconomic mortality differentials. *Eur J Public Health*, 7:385-91.
- Boswell, T., and Dixon, W.J. (1993). Marx's theory of rebellion: a cross-national analysis of class exploitation, economic development, and violent revolt. *Am Soc Rev*, 58:681-702.
- Bourdieu, P. (1984). *Distinction*. Cambridge, MA: Harvard University Press.
- Brooks-Gunn, J., Duncan, G.J., and Aber, J.L. (eds.). (1997). *Neighborhood poverty*. New York: Russell Sage Foundation.
- Carroll, D., Davey Smith, G., and Bennett, P. (1996). Some observations on health and socioeconomic status. *J Health Psychol*, 1:23-39.
- Carstairs, V. (1995). Deprivation indices: their interpretation and use in relation to health. *J Epidemiol Community Health*, 49 Suppl 2:S3-8.
- Corcoran, M.E., and Chaudry, A. (1997). The dynamics of children in poverty. In *The future of children—children in poverty*, vol. 7 (2). Los Altos, CA: Center for the Future of Children, pp. 40-54.
- Daly, M., Duncan, G., Kaplan, G.A., and Lynch, J.W. (1998). Macro-to-micro linkages in the inequality-mortality relationship. *Milbank Mem Fund Q*. 76:315-339.
- Davey Smith, G., and Dorling, D. (1996). "I'm all right, John": voting patterns and mortality in England and Wales, 1981-92. *BMJ*, 313:1573-7.
- Davey Smith, G., and Harding, S. (1997). Is control at work the key to socioeconomic gradients in mortality? (letter). *Lancet*, 350: 1369-70.
- Davey Smith, G., Shipley, M.J., and Rose, G. (1990). Magnitude and causes of socioeconomic differentials in mortality: further evidence from the Whitehall Study. *J Epidemiol Community Health*, 44:265-70.
- Davey Smith, G., Neaton, J.D., Wentworth, D., Stamler, R., and Stamler, J. (1996). Socioeconomic differentials in mortality risk among men screened for the Multiple Risk Factor Intervention Trial: 1. White men. *Am J Public Health*, 86:486-96.
- Davey Smith, G., Hart, C., Blane, D., Gillis C., and Hawthorne, V. (1997). Lifetime socioeconomic position and mortality: prospective observational study. *BMJ*, 314:547-52.
- Davey Smith, G., Hart, C., Blane, D., and Hole, D. (1998a). Adverse socioeconomic conditions in childhood and cause specific adult mortality: prospective observational study. *BMJ*, 316:1631-51.
- Davey Smith, G., Hart, C., Hole D., MacKinnon, P., Gillis, C., Watt, G., Blane, D., and Hawthorne, V. (1998b). Education and occupational social class: which is the more important indicator of mortality risk? *J Epidemiol Community Health*, 52:153-60.
- Davis, K., and Moore, W. (1945). Some principles of social stratification. *Am Soc Rev*, 10: 242-9.
- Desai, S., and Alva, S. (1989). Maternal education and child health: is there a strong causal relationship? *Demography*, 35:71-81.
- Diez-Roux, A.V. (1998). Bringing context back into epidemiology: variables and fallacies in multilevel analysis. *Am J Public Health*, 88:216-22.
- Diez-Roux, A.V., Nieto, F.J., Muntaner, C., Tyroler, H.A., Comstock, G.W., Shahar, E., Cooper, L.S., Watson, R.L., and Szklo, M. (1997). Neighborhood environments and coronary heart disease: a multilevel analysis. *Am J Epidemiol*, 146:48-63.
- Duncan, G.J. (1996). Income dynamics and health. *Int J Health Services*, 26:419-44.
- Duncan, O.D. (1961). A socioeconomic index for all occupations. In: Reiss, A.J. (ed.) *Occupations and Social Status*. New York: Free Press. 109-138.
- Dye, T.D., and Lee, R.V. (1994). Socioeconomic status: developing a quantitative, community based index in rural Kashmir. *J Epidemiol Community Health*, 48:421-2.
- Eames, M., Ben-Shlomo, Y., and Marmot, M.G. (1993). Social deprivation and premature mortality: regional comparison across England. *BMJ*, 307:1007-102.
- Elo, I.T., and Preston, S.H. (1996). Educational differentials in mortality: United States, 1979-85. *Soc Sci Med*, 42:47-57.
- Engels, F. (1848). *The condition of the working class in England* (tr. Henderson, O.W., and Chaloner, W.H., 1958). Stanford, CA: Stanford University Press.
- Erikson, R., and Goldthorpe, J.H. (1992). *The constant flux*. Oxford: Clarendon Press.
- Evans, R.G., Barer, M.L., and Marmor, T.R. (eds.). (1994). *Why are some people healthy and others not?* New York: Aldine de Gruyter.
- Farr, W. (1864). Report of the evidence to the Royal Commission of Mines. In Buck, C., Llopis, A., Najera, E., and Terris, M. (eds.), *The challenge of epidemiology* (1989). Washington, DC: Pan American Health Organization, pp. 67-72.
- Feinstein, J.S. (1993). The relationship between socioeconomic status and health: a review of the literature. *Milbank Mem Fund Q*, 71:279-322.
- Feldman, J.J., Maroc, D.M., Kleinman, J.C., and

- Cornoni-Huntley, J. (1989). National trends in educational differences in mortality. *Am J Epidemiol*, 129:919-33.
- Geronimus, A.T. (1992). The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethnicity Dis*, 2:207-13.
- Geronimus, A.T., and Bound, J. (1998). Use of census-based aggregate variables to proxy for socioeconomic group: evidence from national samples. *Am J Epidemiol*, 148:475-86.
- Haan, M., Kaplan, G.A., and Camacho, T. (1987). Poverty and health: prospective evidence from the Alameda County Study. *Am J Epidemiol*, 125:989-98.
- Haan, M.N., Kaplan, G.A., and Syme, S.L. (1989). Socioeconomic status and health: old observations and new thoughts. In Bunker, J.P., Gornby, D.S., and Kehrer, B.H. (eds.), *Pathways to health: the role of social factors*. Menlo Park, CA: HJ Kaiser Family Foundation, pp. 76-135.
- Haug, M.R. (1977). Measurement in social stratification. *Annu Rev Sociol*, 3:51-77.
- Hollingshead, A.B., and Redlich, F.C. (1958). *Social class and mental illness: a community study*. New York: John Wiley.
- House, J.S., Lepkowski, J.M., Kinney, A.M., Mero, R.P., Kessler, R.C., and Herzog, A.R. (1994). The social stratification of aging and health. *J Health Soc Behav*, 35:213-34.
- Jargowsky, P.A. (1996). Take the money and run: economic segregation in U.S. metropolitan areas. *Am Sociol Rev*, 61:984-98.
- Kaplan, G.A. (1996). People and places: contrasting perspectives on the association between social class and health. *Int J Health Services*, 26:507-19.
- Kaplan, G.A., and Keil, J.E. (1993). Socioeconomic factors and cardiovascular disease: a review of the literature. *Circulation*, 88: 1973-98.
- Kaplan, G.A., and Lynch, J.W. (1997). Whither studies on the socioeconomic foundations of population health? (editorial). *Am J Public Health*, 87:1409-11.
- Kaplan, G.A., Haan, M.N., Syme, S.L., Minkler, M., and Winkleby, M. (1987). Socioeconomic status and health. In Amler, R.W., and Dull, H.B. (eds.), *Closing the gap: the burden of unnecessary illness*. New York: Oxford University Press, pp. 125-129.
- Kaplan, G.A., Pamuk, E., Lynch, J.W., Cohen, R.D., and Balfour, J. (1996). Inequality in income and mortality in the United States: analysis of mortality and potential pathways. *BMJ*, 312:999-1003.
- Karasek, R., and Theorell, T. (1990). *Healthy work*. New York: Basic Books.
- Kaufman, J.S., Cooper, R.S., and McGee, D.L. (1997). Socioeconomic status and health in blacks and whites: the problem of residual confounding and the resiliency of race. *Epidemiology*, 8:621-8.
- Kennedy, B.P., Kawachi, I., and Prothrow-Stith, D. (1996). Income distribution and mortality: cross-sectional ecologic study of the Robin Hood index in the United States. *BMJ*, 312:1004-7.
- Kington, R.S., and Smith, J.P. (1997). Socioeconomic status and racial and ethnic differences in functional status associated with chronic diseases. *Am J Public Health*, 87:805-10.
- Koopman, J.S., Prevots, D.R., Vaca-Marin, M.A., Gomez Dantes, H., Zarate Aquino, M.L., Longini, I.M.Jr, and Sepulveda Amor, J. (1991). Determinants and predictors of dengue infection in Mexico. *Am J Public Health*, 133:1168-78.
- 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 Health*, 45:35-42.
- Krieger, N. (1994). Epidemiology and the web of causation: has anyone seen the spider? *Soc Sci Med*, 39:887-903.
- Krieger, N., Rowley, D., Hermann, 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*, 9 Suppl 6:82-122.
- Krieger, N., Williams, D.R., and Moss, N.E. (1997). Measuring social class in U.S. public health research: concepts, methodologies and guidelines. *Annu Rev Public Health*, 18:341-78.
- Kuh, D., and Ben-Shlomo, Y. (eds.). (1997). *A lifecourse approach to chronic disease epidemiology*. Oxford: Oxford University Press.
- Kunitz, S. (1994). *Disease and social diversity*. New York: Oxford University Press.
- Kunst, A.E., and Mackenbach, J.P. (1994). The size of mortality differences associated with educational level in nine industrialized countries. *Am J Public Health*, 84:932-7.
- Kunst, A.E., Groenhouf, F., Mackenbach, J.P., and Heath, E.W. (1998). Occupational class and cause specific mortality in middle aged men in 11 European countries: comparison of population based studies. *BMJ*, 316:1636-42.
- Liberatos, P., Link, B.G., and Kelsey, J.L. (1988). The measurement of social class in epidemiology. *Epidemiol Rev*, 10:87-121.
- Link, B.G., and Phelan, J. (1995). Social conditions as fundamental causes of disease. *J Health Soc Behav*, Spec No:80-94.
- Lord, W. (1955). *A Night to Remember*. New York: Henry Holt.

- Lundberg, O. (1997). Childhood conditions, sense of coherence, social class and adult ill health: exploring their theoretical and empirical relations. *Soc Sci Med*, 44:821-31.
- Lynch, J.W. (in press). Socioeconomic factors in the behavioral and psychosocial epidemiology of cardiovascular disease. In Schneiderman, N., Gentry, J., da Silva, J.M., Speers, M., and Tomes, H. (eds.), *Integrating behavioral and social sciences with public health*. Washington, DC: APA Press. (in press).
- Lynch, J.W., and Kaplan, G.A. (1997). Understanding how inequality in the distribution of income affects health. *J Health Psychol*, 2:297-314.
- Lynch, J.W., Kaplan, G.A., Cohen, R.D., Kauhainen, J., Wilson, T.W., Smith, N.L., and Salonen, J.T. (1994). Childhood and adult socioeconomic status as predictors of mortality in Finland. *Lancet*, 343:524-7.
- Lynch, J.W., Kaplan, G.A., Cohen, R.D., Tuomilehto, J., and Salonen, J.T. (1996). Do cardiovascular risk factors explain the relation between socioeconomic status, risk of all-cause mortality, cardiovascular mortality and acute myocardial infarction? *Am J Epidemiol*, 144:934-42.
- Lynch, J.W., Kaplan, G.A., Cohen, R.D., Salonen, R., and Salonen, J.T. (1997a). Socioeconomic status and progression of carotid atherosclerosis: prospective evidence from the Kuopio Ischemic Heart Disease Risk Factor Study. *Arterioscler Thromb Vasc Biol*, 17:513-9.
- Lynch, J.W., Kaplan, G.A., and Salonen, J.T. (1997b). Why do poor people behave poorly? Variation in adult health behaviours and psychosocial characteristics by stage of the socioeconomic lifecourse. *Soc Sci Med*, 44:809-19.
- Lynch, J.W., Kaplan, G.A., and Shema, S.J. (1997c). Cumulative impact of sustained economic hardship on physical, cognitive, psychological, and social functioning. *N Engl J Med*, 337:1889-95.
- Lynch, J.W., Krause, N., Kaplan, G.A., Cohen, R.D., Salonen, R., and Salonen, J. T. (1997d). Workplace demands, economic reward and progression of carotid atherosclerosis. *Circulation*, 96:302-8.
- Lynch, J.W., Krause, N., Kaplan, G.A., Tuomilehto, J., and Salonen, J.T. (1997e). Workplace conditions, socioeconomic status and the risk of mortality and acute myocardial infarction: the Kuopio Ischemic Heart Disease Risk Factor Study. *Am J Public Health*, 87:619-24.
- Lynch, J.W., Kaplan, G.A., Pamuk, E., Cohen, R.D., Heck, K., Balfour, J.L., Yen, I.H. (1998). Income inequality and mortality in metropolitan areas of the United States. *Am J Public Health*. 88:1074-1080.
- Macintyre, S. (1997). The Black Report and beyond: what are the issues? *Soc Sci Med*, 44:723-46.
- Macintyre, S., Maciver, S., and Sooman, A. (1993). Area, class and health: should we be focussing on places or people? *J Soc Pol*, 22:213-34.
- Macintyre, S., Ellaway, A., Der, G., Ford, G., and Hunt, K. (1998). Do housing tenure and car access predict health because they are simply markers of income or self-esteem? a Scottish study. *J Epidemiol Community Health*, 52:657-64.
- Mackenbach, J.P., and Kunst, A.E. (1997). Measuring the magnitude of socio-economic inequalities in health: an overview of available measures illustrated with two examples from Europe. *Soc Sci Med*, 44:757-71.
- Mackenbach, J.P., Kunst, A.E., Cavelaars, A.E.J.M., Groenhouf, F., and Geurts, J.J. (1997). Socioeconomic inequalities in morbidity and mortality in western Europe. *Lancet*, 349:1655-9.
- Manuck, S.B., Kaplan, J.R., Adams, M.R., and Clarkson, T.B. (1988). Effects of stress and the sympathetic nervous system on coronary artery atherosclerosis in the cynomolgus macaque. *Am Heart J*, 116:328-33.
- Marmot, M.G., Kogevinas, M., and Elston, M.A. (1987). Social/economic status and disease. *Annu Rev Public Health*, 8:111-37.
- Marmot, M.G., Bosma, H., Hemingway, H., Brunner, E., and Stansfeld, S. (1997). Contribution of job control and other risk factors to social variations in coronary heart disease incidence. *Lancet*, 350:235-9.
- Marx, K. (1894, 1991). *Capital: a critique of political economy*, vol. 3, ed. Engels, F. (tr. Fernbach, D., 1981). London: Penguin Classics, Chapter 47.
- Mayer, S., and Jencks, C. (1989). Poverty and the distribution of material hardship. *J Hum Resour*, 24:88-113.
- McDonough, P., Duncan, G.J., Williams, D., and House, J. (1997). Income dynamics and adult mortality in the United States, 1972 through 1989. *Am J Public Health*, 87:1-8.
- McEwen, B.S. (1998). Protective and damaging effects of stress mediators. *N Engl J Med*, 338:171-9.
- McLeod, J.D., and Kessler, R.C. (1990). Socio-economic status differences in vulnerability to undesirable life events. *J Health Soc Behav*, 31:162-72.
- Miller, D.C. (1983). *Handbook of research design and social measurement*. New York: Longman.
- Morris, J.N., Blane, D.B., and White, I.R.

- (1996). Levels of mortality, education and social conditions in the 107 local education authority areas of England. *J Epidemiol Community Health*, 50:15-7.
- Muntaner, C., and O'Campo, P.J. (1993). A critical appraisal of the demand/control model of the psychosocial work environment: epistemological, social, behavioral and class considerations. *Soc Sci Med*, 36:1509-17.
- Muntaner, C., and Parsons, P.E. (1996). Income, social stratification, class, and private health insurance: a study of the Baltimore area. *Int J Health Serv*, 26:655-71.
- Muntaner, C., Eaton, W.W., Diala, C., Kessler, R.C., and Sorlie, P.D. (1998). Social class, assets, organizational control and the prevalence of common groups of psychiatric disorders. *Soc Sci Med*, 47:2043-53.
- Nam, C.B., and Powers, M.G. (1983). *The socioeconomic approach to status measurement: with a guide to occupational and socioeconomic status scores*. Houston: Cap and Gown Press.
- Nam, C.B., and Terrie, E.W. (1986). *Comparing the 1980 Nam-Powers and Duncan SEI occupational scores*. Tallahassee: Florida State University, Center for the Study of Population.
- National Center for Health Statistics. (1998). *Health, United States, 1998, with socioeconomic status and health chartbook*. Hyattsville, MD: NCHS.
- O'Campo, P., Gielen, A.C., Faden, R.R., Zue, X., Kass, N., and Wang, M. (1995). Violence by male partners against women during the childbearing year: a contextual analysis. *Am J Public Health*, 85:1092-7.
- O'Campo, P., Xue, X., Wang, M., and O'Brien Caughy, M. (1997). Neighborhood risk factors for low birthweight in Baltimore: a multi-level analysis. *Am J Public Health*, 87:1113-8.
- Oliver, M.L., and Shapiro, T.M. (1995). *Black wealth/white wealth*. New York: Routledge.
- Pamuk, E. (1985). Social class and inequality in mortality from 1921-1972 in England and Wales. *Population Studies*, 39:17-31.
- Paracelsus. (1567). On the miner's sickness and other miner's diseases. In Sigerist, H.E. (ed.), *Four treatises of Theophrastus von Hohenheim called Paracelsus* (1941). Baltimore, MD: Johns Hopkins University Press, pp. 56-61.
- Parsons, T. (1970). Equality and inequality in modern society. *Social Inquiry* (special issue): 13-72.
- Poldenak, A.P. (1997). *Segregation, poverty, and mortality in urban African Americans*. New York: Oxford University Press.
- Poulantzas, N. (1975). *Classes in contemporary capitalism*. London: New Left Books.
- Power, C., Hertzman, C., Mathews, S., and Manor, O. (1997). Social differences in health: life-cycle effects between ages 23 and 33 in the 1958 British birth cohort. *Am J Public Health*, 87:1499-503.
- Rather, L.J. (1988). Report on the typhus epidemic in Upper Silesia. In Rather, L.J. (ed.), *Rudolph Virchow: collected essays on public health and epidemiology*, vol. 1. Canton, MA: Science History, pp. 205-20.
- Robert, S.A. (1998). Community-level socioeconomic status effects on adult health. *J Health Soc Behav*, 39:18-37.
- Rose, G., and Marmot, M.G. (1981). Social class and coronary heart disease. *Br Heart J*, 45:13-9.
- Rosen, G. (1993). *A history of public health*. Baltimore: Md., Johns Hopkins University Press.
- Ross, C.E., and Wu, C. (1996). Education, age, and the cumulative advantage in health. *J Health Soc Behav*, 37:104-20.
- Sampson, R.J. (1992). Family management and child development: insights from social disorganization theory. In McCord, J. (ed.), *Facts, frameworks, and forecasts*, vol. 3 of *Advances in criminological theory*. New Brunswick, NJ: Transaction, pp. 63-93.
- Sampson, R.J., Raudenbush, S.W., and Earls, F. (1997). Neighborhoods and violent crime: a multilevel study of collective efficacy. *Science*, 277:918-24.
- Sapolsky, R.M. (1993). Endocrinology alfresco: psychoendocrine studies of wild baboons. *Recent Prog Horm Res*, 48:437-68.
- Schnall, P.L., and Landbergis, P.A. (1994). Job strain and cardiovascular disease. *Annu Rev Public Health*, 15:381-411.
- Schwartz, S. (1994). The fallacy of the ecological fallacy: the potential misuse of a concept and its consequences. *Am J Public Health*, 84:819-24.
- Siegel, P.M. (1971). *Prestige in the American occupational structure*. University of Chicago (doctoral dissertation).
- Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *J Occ Health Psychol*, 1:27-41.
- Siegrist, J., Peter, R., Junge, A., Cremer, P., and Seidel, D. (1990). Low status control, high effort at work and ischemic heart disease: prospective evidence from blue-collar men. *Soc Sci Med*, 31:1127-34.
- Smith, J.P. (1995). Racial and ethnic differences in wealth in the Health and Retirement Study. *J Hum Resources*, 30 Suppl: S158-83.
- Smith, J.P. (1999). Healthy bodies and thick wallets: the dual relation between health and economic status. *J Economic Perspectives* 13:145-66.
- Smith, J.P., and Kington, R.S. (1997). Demo-

- graphic and economic correlates of health in old age. *Demography*, 34:159-70.
- Sorlie, P.D., Backlund, E., and Keller, J.B. (1995). U.S. mortality by economic, demographic, and social characteristics: the National Longitudinal Mortality Study. *Am J Public Health*, 85:949-56.
- Susser, M., Watson, W., and Hopper, K. (1985). *Sociology in medicine*. New York: Oxford University Press.
- Syme, S.L., and Berkman, L.F. (1976). Social class, susceptibility, and sickness. *Am J Epidemiol*, 104:1-8.
- Szreter, S.R. (1984). The genesis of the Registrar General's social classification of occupations. *Br J Sociol*, 35:522-46.
- Szreter, S.R. (1997). Economic growth, disruption, deprivation, disease, and death: on the importance of the politics of public health for development. *Popul Dev Rev*, 23:693-728.
- Townsend, P., and Davidson, N. (eds.). (1982). *Inequalities in health: the Black Report*. Harmondsworth, UK: Penguin.
- Townsend, P., Phillimore, P., and Beattie, A. (1988). *Health and deprivation: inequality in the North*. London: Croom Helm.
- Treiman, D.J. (1977). *Occupational prestige in comparative perspective*. New York: Academic Press.
- Trout, D.D. (1993). *The thin red line: how the poor still pay more*. Oakland, CA: Consumers Union.
- Turner, R.J., Wheaton, B., and Lloyd, D.A. (1995). The epidemiology of social stress. *Am Sociol Rev*, 60:104-25.
- U.S. Census Bureau. (1963). *Methodology and scores of socioeconomic status*. (Working Paper No. 15.) Washington, DC: U.S. Government Printing Office.
- Vågerö, D., and Illsley, R. (1995). Explaining health inequalities: beyond Black and Barker. *Eur Sociol Rev*, 11:219-41.
- Villermé, L.R. (1840). *Tableau de l'état physique et moral des ouvriers employés dans les manufactures de coton, de laine et de soie*. Paris: Jules Renouard.
- Wagstaff, A., Paci, P., and van Doorslaer, E. (1991). On the measurement of inequalities in health. *Soc Sci Med*, 33:545-7.
- Warner, W.L. (1960). *Social class in America*. New York: Harper and Row.
- Weber, M. (1922). Class, status, party. In Gerth, H.H., and Mills, C.W. (eds.), *From Max Weber: essays in sociology* (1958). New York: Routledge and Kegan Paul, pp. 180-95.
- Wilkinson, R.G. (1996). *Unhealthy societies*. London: Routledge.
- Williams, D.R. (1990). Socioeconomic differentials in health: a review and redirection. *Soc Psychol Q*, 53:81-99.
- Wilson, W.J. (1987). *The truly disadvantaged*. Chicago: University of Chicago Press.
- Wing, S., Casper, M., Riggan, W., Hayes, C., and Tyroler, H.A. (1988). Socioenvironmental characteristics associated with the onset of decline of ischemic heart disease mortality in the United States. *Am J Public Health*, 78:923-6.
- Wing, S., Barnett, E., Casper, M., and Tyroler, H.A. (1992). Geographic and socioeconomic variation in the onset of decline of coronary heart disease mortality in white women. *Am J Public Health*, 82:204-9.
- Winkleby, M.A., Jatulis, D.E., and Fortmann, S.P. (1992). Socioeconomic status and health: how education, income and occupation contribute to risk factors for cardiovascular disease. *Am J Public Health*, 82:816-20.
- Wohlfarth, T. (1997). Socioeconomic inequality and psychopathology: are socioeconomic status and social class interchangeable? *Soc Sci Med*, 45:339-410.
- Wolfson, M., Rowe, G., Gentleman, J.F., and Tomiak, M. (1993). Career earnings and death: a longitudinal analysis of older Canadian men. *J Gerontol Soc Sci*, 48:S167-79.
- Wright, E.O. (1985). *Classes*. London: Verso.
- Wright, E.O. (1994). *Interrogating inequality*. London: Verso.
- Wright, E.O. (1996). *Class counts: comparative studies in class analysis*. New York: Cambridge University Press.