

Social Epidemiology: Definition, History, and Research Examples

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Abstract

Social epidemiology is a branch of epidemiology that focuses particularly on the effects of social-structural factors on states of health. Social epidemiology assumes that the distribution of advantages and disadvantages in a society reflects the distribution of health and disease. It proposes to identify societal characteristics that affect the pattern of disease and health distribution in a society and to understand its mechanisms. The central and initial question of social epidemiology to be answered is what effect do social factors have on individual and population health. However, the new focus on this theme using current epidemiological methods is a relatively recent phenomenon. There are several significant concepts in the field of social epidemiology: 1) the bio-psychosocial paradigm, 2) the population perspective, 3) use of new statistical approaches such as multilevel analysis, and 4) significance of theory.

The relationship between social class and health has been a major research field since the beginning of public health history. Many studies have identified the disparities in health among social classes and developed several theories, such as social selection theory and socio-biological translation theory. However, despite the long history of this research field, the effect of social class on health is not yet fully understood.

Income distribution and health is a relatively new field within social epidemiology. Three possible mechanisms for the consequences of income distribution on health are 1) disinvestment of human capital, 2) disinvestment of social capital, and 3) psychological process. Refining theories of income distribution is a major challenge in research on income distribution.

Key words: society, epidemiology, health, social class, income distribution

Introduction

The basic theme of social epidemiology, that social conditions affect population health, is not new; several investigations based on the idea were conducted in the 19th century. As a branch of epidemiological study, however, social epidemiology is relatively new. Over the last few decades, the discipline of social epidemiology has developed by refocusing on its traditional perspective with contemporary epidemiological methods in order to understand disease etiology that includes social experiences as direct causes of diseases. In this review, I will offer first a brief description of social epidemiology, and then

introduce examples of social epidemiological research, social class and income distribution.

Social epidemiology

1. What is social epidemiology?

Social epidemiology is a branch of epidemiology that studies the distribution and determinants of health and disease in populations (2). In “Social Epidemiology,” Berkman and Kawachi defined social epidemiology as “the branch of epidemiology that studies the social distribution and social determinants of states of health (1).” Social epidemiology focuses particularly on the effects of sociostructural factors on states of health (Table 1).

The major premise of social epidemiology is that each society forms its own distribution of health and disease (1). In other words, social epidemiology assumes that the distribution of health and disease in a society reflects the distribution of advantages and disadvantages in that society. Based on this premise, social epidemiology examines which sociostructural

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Table 1 Examples of sociostructural factors in the field of social epidemiology

Social class
Gender
Race/ethnicity
Discrimination
Social network
Social capital
Income distribution
Social policy

factors affect the distribution of health and disease, as well as how these factors influence individual and population health. Social epidemiology proposes to identify societal characteristics that affect the pattern of disease and health distribution in a society and to understand its mechanisms (1). Although social epidemiology has developed recently, the idea that social conditions affect health already existed at the beginning of the 19th century (1, 3). In the next section, I will look at the history of social epidemiology and how social epidemiology grew out of traditional studies.

2. History of social epidemiology

In the beginning of the 19th century, several investigations were conducted based on the idea that social conditions affect health (4). In France, Villerme examined differences in mortality between the poor and the affluent. He emphasized that improved schooling and working conditions would reduce disparities in mortality between the poor and the affluent (5). In Germany, Virchow reported the relationship between poor social conditions and the typhus epidemic in Upper Silesia. He speculated that unequal access to society’s products was the fundamental cause of unequal distribution of diseases in the society. He highlighted the central role of social conditions in population health (3, 6). In the middle of the 19th century, Chadwick reported that unsanitary soil, air, and water were major causes of diseases and promoted sanitation measures to improve the health of the poor (7). Clearly, studies in the beginning and middle of the 19th century were conducted with the assumption that societal conditions affect physical health (8).

At the end of the 19th century, germ theory came into fashion; germs were considered the major cause of diseases (3, 8, 9). Epidemiological studies during this period concentrated on identifying new germs that cause diseases. Consequently, the idea that social conditions affect health was overshadowed. In the early 20th century, the idea flourished that it was exposure to a single individual risk factor, including germs, that led to disease; however, with the rise of infectious diseases, the idea that disease is caused by exposure to multiple individual risk factors, the so-called “web of causation,” entered the mainstream of epidemiological theories (3, 8). Modern epidemiology has developed based upon this multi-factorial model. The original concept of social epidemiology was concealed within the prosperity of modern epidemiology (3, 8).

By the 1980s, however, several epidemiologists developed

social epidemiology, underscoring the importance of socio-structural factors on health as well as in a population perspective (3). In a backlash against the strong individualism of modern epidemiology, social epidemiologists argued for the need to return to the traditional epidemiological theme: how do social conditions produce patterns of health and disease (8)? The central question of social epidemiology—what are the effects of social factors such as social structure, culture, and environment on both individual and population health—has existed since the beginning of epidemiological history. However, the new focus on this theme using current epidemiological methods is a relatively recent phenomenon.

3. Significant concepts of social epidemiology

In this section, I will present several significant concepts of the field of social epidemiology. These concepts are not limited to social epidemiology alone, but they are fully applicable to modern epidemiology as well.

First, the bio-psychosocial paradigm is an important concept in social epidemiology. Social epidemiology uses the bio-psychosocial paradigm in contrast, modern epidemiology often uses the biological paradigm (10–12). The biological paradigm assumes that all diseases are biological phenomena and can be described fully in biological terms. It guides the views that a population is merely the sum of its individuals, and that the population pattern of diseases is simply a reflection of individual risk factors. Consequently, social level factors cannot be considered “real” causes of diseases, if the biological paradigm is used (3, 13). In contrast, the bio-psychosocial paradigm of social epidemiology assumes that the biology of organisms is determined in multilevel, interactive environments (11, 12). In other words, diseases are assumed to be products of mutual interaction among social factors, individual factors, and biological factors. The bio-psychosocial paradigm assumes that population is not merely the sum of its individuals; rather, every population has its own history and culture, which determine how and why people are exposed to specific individual risk

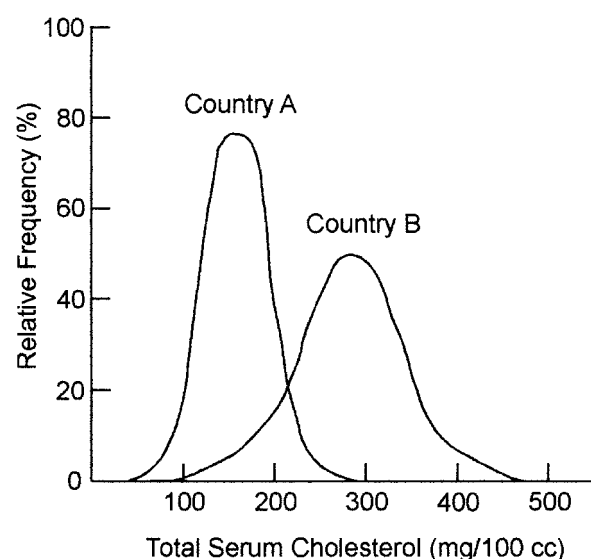


Fig. 1 The contrasting distributions of serum cholesterol between Countries A and B.

factors. In social epidemiology, social factors can be risk factors of health by adding to or interacting with individual and biological factors.

Population perspective is another significant concept in the field of social epidemiology. Geoffrey Rose pointed out that an individual's risk of disease cannot be isolated from the disease risks of the population to which s/he belongs (14). This is Rose's population perspective, which has a crucial meaning in social epidemiology.

Figure 1 shows the distributions of serum cholesterol in Country A and Country B. Judging from the figure, we can predict that a person living in Country B is more likely to die prematurely of a heart attack compared to someone living in Country A. This prediction is reasonable not only because any given person in Country B may have a high cholesterol level, but also because the population distribution of cholesterol level in Country B as a whole is higher than that of Country A. Why is the distribution of cholesterol in Country B at a higher level than in Country A? What caused the difference between these distributions? In order to answer these questions, it is crucial to consider society as a whole. Asking why a population has a particular distribution of risk is different from the etiological question of why a particular individual got sick (15). Social epidemiology is particularly interested in the first question, that of distribution. Researchers in social epidemiology look for sociostructural factors that affect distributions of diseases and risk factors, and they propose measures to shift these distributions in the desired direction, as a "population strategy." Population perspective and population strategy are essential to social epidemiology (1).

A third important concept in the field of social epidemiology is the use of new statistical approaches, such as multilevel analysis (10), to determine the effects of sociostructural factors on health (16). Multilevel analysis allows several levels of analysis to be accounted for simultaneously and more effectively than in conventional multivariate analysis (17). The importance of a multilevel statistical approach for social epidemiology is discussed below.

There is an important distinction between compositional and contextual explanations of the effects of sociostructural factors on health in social epidemiology (16). A compositional explanation would assert that a group includes different types of individuals, and that the differences among those individuals account for the observed differences between groups (16). For example, Region A has more poor residents and a lower average life expectancy compared to Region B. Assuming that poor people die at younger ages than rich people, it is not surprising that Region A has a lower average life expectancy. The observed difference in average life expectancy between the two regions is explained purely by the concentration of poor or rich people in each region. Poor people would die younger and rich people would live longer, wherever they live. The variation in average life expectancy between the groups is explained by an individual level factor, such as poverty. This is an example of compositional explanation.

Contextual explanation, on the other hand, holds that social level factors, such as features of physical and social environments, influence health either in addition to, or in interaction

with, individual characteristics (16). Using the example above, contextual explanation asserts that residents in Region B tend to live longer than those in Region A, regardless of rich or poor status, because Region B might have more favorable social and physical environments, such as a more comfortable climate, less pollution, more recreation facilities, or more public services, than Region A. The features of the physical and social environments within Region B might allow both rich and poor people to enjoy healthy life, whereas in Region A, rich people could be healthy as they benefit from their individual property, while poor people might die young. Therefore, the average life expectancy in Region A is expected to be shorter than that in Region B.

Social epidemiology is concerned with the effect of social features. New statistical approaches such as multilevel modeling allow us to examine the relative importance of individual and social factors or the interaction between individual and social factors, permitting several levels of analysis to be controlled for simultaneously (17).

This multilevel approach allows epidemiologists to develop quantitative and structural analyses of social factors as they affect health, and has contributed significantly to the development of social epidemiology. However, social epidemiology does not always require multilevel analysis. Although I introduced multilevel analysis as an example of new statistical approaches for social epidemiology, in some cases other statistical approaches, such as path analysis and ecological analysis, may be more appropriate than multilevel analysis. It is important to note that researchers should choose the most appropriate statistical approach that fits their research aim.

Lastly, the use of theory is another significant concept in social epidemiology. Social epidemiology requires the use of theory to build hypotheses and interpret results (1). Social epidemiologists select variables in statistical models based upon a conceptual framework that indicates hierarchical relationships among factors. This conceptual framework is built upon theory. For example, in a model of social class and congenital heart disease (CHD), controlling for smoking implicitly assumes that social class has a direct effect on CHD independent of smoking. Also, if a statistical association between social class and CHD disappears when smoking behavior is accounted for, the hypothesized theory will tell us whether the effect of social class on CHD is spurious, or mediated by smoking behavior. It is necessary to have conceptual clarity about the relationships between independent sociostructural factors, possible intervening variables, and health outcomes. Theory is a significant tool for social epidemiological studies. Berkman said: "Without hypotheses that can be clearly supported or refuted, without having a clear understanding of temporal sequencing or biological plausibility, and without articulated theories and specific concepts to guide empirical investigation, we will not be able to make progress (1)."

Research examples

In this section, I will introduce two examples of social epidemiological research: social class and income distribution. Social class and health have been a traditional theme for epidemiology. In contrast, income distribution is a relatively new

concept in epidemiology. Considering the recent tendency of the increasing gap among social classes and unequal income distribution in Japan (17), both social class and income distribution are relevant and significant epidemiological research themes to Japanese society.

1. Social class

A great number of studies have identified disparities in health among social classes (19, 21–23). One of the noteworthy points we need to recognize in terms of the relationship between social class and health is that disparities in health are gradual and exist across all social classes. Many previous studies have found that the relationship between health and social class cannot be fully explained by poverty (24, 25).

Several theories explain how health disparities are generated among social classes. Social selection is one major classical theory (26). It asserts that a person's health status determines his or her social class, rather than vice versa (26). This theory maintains that a person with poor health is likely to be in a low social class because his chance to hold a job may be limited due to his poor health status. However, this theory has not been supported by evidence and contains some contradictions (27, 28). For example, did people with respiratory problems become coal miners? Or, did coal miners get respiratory dysfunction from their work? It is more reasonable to think coal miners developed respiratory problems from their work, and several longitudinal studies have provided evidence of this.

There is also socio-biological translation theory, in which social class influences biological functions through several paths that, in turn, affect health status (29). For example, the physical environments in which one lives and works are major pathways between social class and health (26, 29). Physical environment affects health by exposing people to carcinogens and other environmental hazards. It is hypothesized that the poor tend to live and work in more hazardous environments, such as polluted neighborhoods and unsafe working conditions; thus, differences in physical environment among social classes are hypothesized to lead to disparities in health among social classes (30).

Social environment is another major pathway (31). Social environment affects health differently by providing vulnerability to interpersonal aggression or violence to some, and access to social resources and support to others. People in low social classes are more likely to live and work in unsafe neighborhoods, which provide higher chances of becoming victims of crimes, compared to people in high social classes (32). Also, because people in low social classes have limited access to social resources and social support considered to have a protective health effect, their health, in the face of equivalent exposure to risk factors, would be damaged even more than the health of those in high social classes (33).

Another relationship between social class and health is explained through socialization and experiences (34). The effect of social class on health may be mediated by social experiences; daily experiences may vary by different social class. These social experiences are hypothesized to influence psychological development, ongoing mood, and cognition, which, in turn, impact health status (35). For example, people in low social

classes may have more anxiety, anger, or depression than those in high social classes as a result of financial difficulty. Accordingly, they may have a more deteriorated health status due to a higher risk of CHD, accident, violence, or suicide compared to those in high social classes.

Finally, social class may affect health through health behaviors. Health behaviors are not randomly distributed in a society, but often are socially patterned. Many risky health behaviors for chronic diseases, such as smoking, physical inactivity, and dietary fat intake, are more prevalent in lower social class groups (36). Social context has a strong impact on health behaviors (37). Even when an individual is interested in improving her health behavior, it may be difficult to accomplish in unfavorable social conditions. People in low social classes tend to have more barriers to behavior change in their social conditions compared with those in high social classes, which might lead to differences in health status between classes.

Research in social class and health has several challenges. First, theoretically grounded research is needed in order to make it clear how social class affects health (38). It is important to be clear about the underlying models. Social class gradients can be seen as expressions of differences in wealth and income, exposure to health-damaging physical environments, access to support and resources, and attainment of education and coping skills. However, often it is not explicit which underlying model is being assumed. Second, having valid and reliable measurements for social class is another challenge (38). In order to improve the measurement of social class, we must offer explicit hypotheses about which aspects of social class convey health risks.

Social class is a traditional but still significant theme for social epidemiology. A great number of studies have shown a gradient effect of social class on health; the relationship between health and social class cannot be fully explained by poverty. Despite much effort, the effect of social class on health is not yet fully understood. We need more theoretically grounded research with improved measurement of social class to understand the effect of social class on health.

2. Income distribution

Although the relationship between income and health has been well established, income distribution and health is a relatively new field in social epidemiology. There have been several significant studies conducted within one country, and others among multiple countries (39–41). For example, Kennedy et al. studied the relationship between the degree of household income inequality across the 50 U.S. states and state-level variation in age-adjusted total mortality rates (42). They found a strong correlation between the so-called Robin Hood Index and age-adjusted total and cause-specific mortality rates (42). The Robin Hood Index indicates “the proportion of aggregate income that must be redistributed from rich to poor households in order to attain perfect equality of incomes (43).” A lower point of this measurement indicates more equal distribution of income; a higher point represents unequal income distribution. The positive correlation between the Robin Hood Index and age-adjusted total and cause-specific mortality rates persisted even after accounting for poverty rates, median household income, urban/

rural mix, and health behavior, such as cigarette smoking rates (42). States with unequal income distribution have a higher mortality rate, on average, than states with equal income distribution. In Japan, Sibuya et al. studied the relationship between individual income, income distribution and self-rated health. They reported that individual income has a stronger association with self-rated health than income inequality at the prefecture level in Japan (44).

Based on evidence from studies on the degree of income distribution and population health, the relationship between income distribution and health became plausible (43). Then, we ask, how does income distribution influence health? There are at least three proposed pathways through which income distribution may affect health. First, income inequality may lead to underinvestment in human capital (40). Kaplan et al. reported a significant correlation between the degree of income inequality and indicators of human capital (40). States with higher income inequality spent smaller proportions of their state budgets on education, which leads to lower educational outcomes. One reason that income distribution translates into human capital is the divergence in interests of the rich from those of the poor. For example, the rich may lose their interest in public education because they can educate their children privately. According to Krugman, "A family at the 95th percentile [in income] pays a lot more in taxes than a family at the 50th, but it does not receive a correspondingly higher benefit from public services, such as education. The greater the income gap is, the greater the disparity in interests is. This translates, because of the clout of the elite, into a constant pressure for lower taxes and reduced public services (45)." Reduced social spending translates into poorer population health.

A second pathway is disinvestment in social capital (46). Social capital is defined as "those features of social structures—such as levels of interpersonal trust and norms of reciprocity and mutual aid—which act as resources for individuals and facilitate collective action (43)." Social capital is an ecological dimension of society, in contrast to concepts of social network or social support, which are individual characteristics. Kawachi et al. reported the relationship between state-level social capital and individually self-rated health; the self-rated health of individuals living in states with high social capital tends to be higher than in states with low social capital (47). Unequal income distribution breeds conflicts among groups and erodes social solidarity. As a result, unequal income distribution impairs individual health through violence, psychological anxiety, and concerns among members of the society, which come of disinvestment in social capital (47, 48).

A third pathway is psychological process; income inequality might produce ill health through a psychologically mediated effect of relative deprivation (49). A widening income gap in a society may produce psychological frustration and envy among

residents through social comparison. Psychological emotion is a pathway through which income distribution affects health.

Refining theories of income distribution is a major challenge in research on income distribution. In order to meet this challenge, several tasks must be accomplished (43). It is crucial to sort out confounding factors from mediating factors that lie in the pathway between income distribution and health. For example, is unemployment a confounding factor or a mediating factor? It is important to identify and account for confounding factors in order to capture the effect of income distribution. It is also important to consider the appropriate geographical aggregation level; does income distribution affect health at the country level, state level, or county level? Studies with multiple-level data on income distribution are needed to answer this question. Lastly, there is little known about time-trend in income distribution, and time series analysis is needed to understand it.

Income distribution is a new research field in social epidemiology. Recent studies have shown that the effect of income distribution on health is not entirely explained by a compositional effect (wherein the effect of income inequality is explained by a concentration of poor people in an area with high income inequality), and there is some evidence of contextual effect of income distribution on health. More studies on income distribution and health are needed in order to refine theories.

Conclusion

Social epidemiology is a branch of epidemiology that focuses particularly on the effects of social-structural factors on states of health. The central and initial question of social epidemiology is what effect do social factors, such as social structure, culture, or environment, have on individual and population health. However, the new focus on this question using current epidemiological methods is a relatively recent phenomenon.

The term "social epidemiology" has started to be known and several social epidemiological studies have already been conducted in Japan (44). Social epidemiology may contribute to public health by providing hints for social, environmental, and political intervention. The Japanese government has proposed a national public health campaign, "The 21st Healthy Japan", aiming for the realization of a healthy life for each person in Japan. Social epidemiology may be a crucial tool in considering concrete measures to accomplish this purpose. A social epidemiological view should be taken into account to promote population health.

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