

SOCIAL EPIDEMIOLOGY

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LEARNING OBJECTIVES:

1. Describe the discipline of social epidemiology and its influences on health.
2. List the key historical developments for the field of social epidemiology.
3. Evaluate the influences of social determinants on the health care system, the delivery of health care and disparities in health care.
4. Analyze the societal, economic, cultural and environmental conditions that influence health.
5. Apply concepts of social epidemiology and social determinants of health to pharmacy practice.

KEY TERMS

Health disparities

Health equity

Health-In-All policies

Secondary data analysis

Social determinants of health

Social epidemiology

This chapter provides an orientation to social epidemiology and its influences on health, the healthcare system, and the delivery of health care. Throughout the chapter there will be a broad emphasis on social structures because every aspect of the social world in which we live, work and play has the potential to affect our health. The intent is to apply the concepts introduced in this chapter to the practice of pharmacy.

We will begin with a definition of social epidemiology. Social epidemiology is a branch of epidemiology that studies the distribution and determinants of health and disease in populations while considering the social context in which they occur (Succer, 1973; Krieger, 2001). Social epidemiologists focus on the underlying patterns of health and disease and the root causes for differences in experiences among groups of people (Galea, 2013).

HISTORICAL CONTEXT

Even though social epidemiology was not widely recognized as a discipline until the 1980s, thinking about disease causation within a social context has a long history (Syme, 2005). In 1662, for example, John Graunt, the demographer for London, used “Bills of Mortality” to develop the first lifetable of probabilities of death. He also quantified disease patterns and investigated their association with age, sex, and other factors (Graunt, 1665). In 1840, Louis Rene Villermé, a French physician, published a study of the working conditions of French cotton, wool and silk workers and their elevated levels of illness. His report was the first to stress the importance of the work environment (Coleman, 1982). As a last example, the location of disease outbreaks was investigated by John Snow in London leading to his publication of the Germ Theory of disease in 1849. Snow predicted the mortality impact of cholera in Britain and in 1854 correctly identified the source of a cholera outbreak in London to contaminated water at a street pump. His work led to public action to limit the spread of communicable disease, establishing one of the first priorities of public health (Hempel, 2007).

As a pure definition, the occurrence of disease is biological—disease is an alteration of the anatomy or physiology of the human body (Diez-Roux, 1998; Galea and Link, 2013) and, therefore, ‘good health’ is simply the absence of disease or illness (Grad, 2002). This bio-medical model of health postulated that a disease or illness was the result of a single, causal factor and the removal of the causal factor would return an individual to a healthy state (Porter, 1997; Wade and Halligan, 2004). Studying disease from the individual perspective led to important understandings of the role of working conditions on disease and mortality.

There have also been important relationships identified for the role that an individual’s lifestyle plays in not only the occurrence of the disease but the disease experience (i.e., the manifestation of the disease, the decision to seek health care, the decision to accept treatment recommendations, and the outcomes resulting from these decisions). Today we place great importance on aspects of our lives that contribute to disease. A good example is cardiovascular disease, where lifestyle decisions including diet, exercise, and other risk behaviors such as smoking are recognized as strong contributors to disease risk and ultimately diagnosis.

Beginning in the years following World War II, a new paradigm of health emerged, the 'social model of health' (WHO, 2002). The World Health Organization first described this less biologically dependent idea of health in its constitution signed in 1946. Health was not merely the absence of disease; health was a "complete state of physical, mental and social well-being." This represented a world-wide recognition that disease and illness are, in part, the result of psycho-social factors and not necessarily obvious medical causes. The introduction of the social model of health forced epidemiologists to again consider the dimensions of populations or societies that had been part of the early pioneering efforts to establish epidemiology.

The blending of the two health models (the biologic model and the social model) helps inform our current view of health. The two models are complementary—neither one alone can fully explain the differences in the impact that disease has on the health and well-being of individuals and communities. Both have contributed to a mounting array of evidence arguing for the need to understand and consider the social determinants of health and their role in the public response to community health needs.

SOCIAL DETERMINANTS OF HEALTH AND HEALTH DISPARITIES

Understanding health problems and the etiology of disease requires a critical study of the social determinants of health. A population's health care needs exist within an ever-changing social and environmental backdrop (Kaplan and Lynch, 1997). There are longstanding features of society—poverty, social class, gender, race, and culture—that have been associated with differences in the incidence, prevalence and the treatment of disease and illness that are always present. Other features—environmental, political and economic—carry differing weights of influence over time. These features of society, identified collectively as social determinants, impact the health of populations to differing degrees and work in tandem to impact an individual's or a population's vulnerability to disease and illness (Diez-Roux, 1998).

Numerous models have been developed to explain the interactions among social determinants and prevalence of disease, since the first model was introduced by WHO. They all identify dominant social contributors impacting population health including individual factors; social and community influences; and economic, cultural and environmental conditions at the societal level (Table 2-1). It is important to remember that no one factor works on its own—there are always multiple factors at work. There are strong correlations, for example, between social networks and the experience of disease. Race and ethnicity are factors that are influenced by social norms, and impacted by multiple economic, cultural and environmental conditions that exist at the societal level. Even so, while poor health outcomes may be related to race and ethnicity, they do not explain all instances of poor health, in which case other social determinants are more likely at play (McCartney et al, 2013).

TABLE 2-1: LAYERS OF SOCIAL DETERMINANTS AFFECTING HEALTH

SOCIETAL ECONOMIC, CULTURAL AND ENVIRONMENTAL CONDITIONS						
Agricultural and food production	Education	Environmental Conditions	Employment opportunities	Water and sanitation	Health care services	Housing
SOCIAL AND COMMUNITY INFLUENCES						
Electronic Media	Social Media	Friend and Family Relationships	Community Affiliations	Social Norms	Religious/Spiritual Organizations	Socioeconomic Factors
INDIVIDUAL FACTORS						
Age	Sex	Gender and sexual orientation	Race and Ethnicity	Socioeconomic Status	Educational Attainment	Religious Affiliation

It is also important to note that there are numerous competing needs that must be addressed within a society to achieve what is determined to be an acceptable standard of living. In communities with high unemployment rates, there may be a willingness to give up air quality for the establishment of an industry bringing jobs. More jobs may lead to increases in income for residents. Unfortunately, there will also be an increase in respiratory health concerns. Another example is in the raising of animals for meat. Government regulators may allow the use of antibiotics to address problems introduced with large scale production but in doing so may expose consumers to harm from these drugs.

SOCIOECONOMIC STATUS

Social epidemiology assumes that the distribution of health and disease in a society reflects the distribution of wealth and resources in that society (Honjo, 2004). In general wealthy individuals enjoy good health and the means to satisfy all of their health care needs. In that regard, the United States should be considered the healthiest of nations given its status as one of the world's wealthiest countries. This is not the case, however, because of the many levels of disparities that exist within this nation's borders. Therefore, social epidemiology seeks to understand and explain the impact of socioeconomic status on health.

Despite America's wealth, millions of American families are food insecure with family incomes below poverty level. This same population is more likely to bear the consequences of obesity and poor diet, develop chronic diseases at a faster rate and be treated at later stages of disease (Abegunde et al, 2007). Foods most readily available to low-income persons are those high in fat, calories, sodium and sugar, and may not provide adequate nutrition.

On a daily basis, persons of low economic status face difficult decisions—buy food or buy medications; pay for heat or go hungry—decisions not faced by higher SES individuals. According to the USDA the cost of food at home for a family of four with a low cost food plan was \$722 per month or \$8,664 per year (USDA, 2015). For a family of 4 earning the 2014 median US income of \$53,600 (DeNavis-Walt and Proctor,

2015), this expense represents 16% of their income. For a family of 4 at 133% of the federal poverty level of \$32,252 (the ACA expanded coverage level) this expense represents 27% of their income—more than one-fourth of the income needed to provide for all of the needs of a family.

Socioeconomic status (SES) also encompasses educational attainment, employment, and other social benefits that are directly related to factors like social standing, and the ability to satisfy basic life needs like housing (Phelan et al, 2010). For example, a person with a high SES can afford to live in a neighborhood populated by persons of similar SES status. Collectively they are able to exert social and political influence to ensure that crime, noise, violence, pollution, traffic and unsanitary conditions are minimized. Their shared collective influence also ensures high quality social activities, recreational opportunities (parks, playgrounds), community resources like grocery stores and service companies and health-care facilities in close proximity, all of which are associated with better health (Phelan et al, 2010). Thus, a person with high SES receives health benefits in less obvious ways that lower SES persons cannot.

Research has established relationships between SES and health that help to explain differences in the etiology of diseases or illnesses, the personal and community experience of diseases and illnesses, the access to health care services to treat diseases and illnesses, and ultimately the causes of death (Susser and Susser, 1996; Diez-Roux, 1998; Honjo, 2004; Phelan et al, 2010). Since the earliest studies of SES and health, health status improves as economic means increase (Adler and Ostrove, 2006). Widespread manifestations of disease, some urinary and bladder afflictions (Ansari and Gupta, 2003), for instance are linked to lack of wealth and diet deficiencies. Social environment and economic conditions have also gained greater attention as important causal factors in the pathway from chronic kidney disease risk to the development and complications of the disease (Nicholas et al, 2015).

Individuals are born into social classes where they may live in environments overwhelmed with air pollution and chemical contaminants affecting their food and water, leading to differential exposure to pathogens and carcinogens. They also will live in poor housing where contaminants like lead and carbon monoxide are more evident. Persons may also have the unfortunate reality of residing in communities where crime is rampant, educational opportunities are few and household stress is virtually unmanageable (Hilfiker, 2000). These environmental concerns, largely outside of the individual's control, have large impacts on health.

As a result of their social standing, individuals may practice certain health behaviors that have a damaging effect on their health. Smoking, unhealthy eating, physical inactivity, alcohol and drug use are regular culprits of poor health and all have an effect on a person's mortality. The *Health and Retirement Study*, a longitudinal, biennial survey of a national sample of adults born between 1931 and 1941, investigated the extent to which these factors supported the association between SES and all-cause mortality. Researchers found that after ten years, the most economically disadvantaged had a higher risk ratio, most of which was due to their poor health practices (Nandi et al, 2014). A retrospective analysis of data from the Whitehall II study showed similar results among British subjects, where approximately one-half to three-quarters of the association between SES and mortality were mediated by poor health behaviors (Nandi et al, 2014).

Social programs have attempted to address health-related SES disparities. Government programs in the U.S., like Medicare and Medicaid, were originally created in an attempt to mitigate income and resource challenges experienced by elders and low-income families with children. Medicare, established by the Johnson Administration in 1965, has provided universal access to health care services primarily for the age group sixty-five and older. Medicaid, also established in 1965, is a shared state and federal program providing coverage to nearly 60 million Americans, including children, pregnant women, parents, seniors and individuals with disabilities.

The Affordable Care Act (ACA) is the latest U.S. national policy attempt to bring forward changes to the nation's health care system. It aims to decrease the number of uninsured, improve quality of care, diversify the workforce and incentivize providers to better serve underserved urban and rural areas. For lower income individuals the ACA subsidizes private based insurance premiums, allowing them greater access to health insurance policies that meet acceptable standards of coverage (HHS, 2015). The ACA, for instance, authorizes the federal government to offer resources to states so that they may expand their Medicaid programs. However, even with government support, a number of states have rejected the notion of expansion citing its potential high cost. Proponents of expansion suggest that the likely cost reductions in prevention of mortality, particularly with the use of prescription drug therapies in underserved or vulnerable populations, far outweigh the costs required to expand the program (Kesselheim et al, 2015).

Even with local, national and international efforts, SES continues to have a measurable impact on health. This idea is demonstrated in Medicare patients with recurring myocardial infarction (MI) where access to care services was not a challenge; still patients with lower educational levels had both higher reoccurrence of MI and higher mortality rates (Coady et al, 2014). The same is true for chronic conditions like diabetes where, despite the availability of health insurance through Medicaid and Medicare and in spite of increased funding for research and prevention initiatives, approximately 14 million people suffer from the disease—6% of whom are Native American and Alaskan Native (CDC, 2014). The Department of Health and Human Services, Indian Health Service Division, offers low cost or no cost disease prevention and management programs, but still the American Native population suffers from diabetes prevalence and complications at alarming rates (Chow et al, 2012). Socioeconomic inequalities in health are very large, very robust, and have remained remarkably unchanged over time. Society's poor and less privileged members live in worse health and die earlier than more privileged members (Phelan et al, 2010).

RACE AND ETHNICITY

There is a large body of evidence demonstrating the influence of race and ethnicity on health; the incidence and prevalence of disease; the individual, family and community experience of disease and illness; access to health care services; the quality of health care services received; and the level of patient participation in shared decision-making and self-management of disease. Various indicators of race and ethnicity have been used in these studies including native language; cultural norms; religious and spiritual traditions and values; geographic origin; ancestral and family patterns;

relationship formation and the quality of relationships; attitudes toward illness and disease; and attitudes toward treatment (Williams, 2005). Other indicators related to race and ethnicity, such as life stress and psychological, social and emotional stress related to the experience of discrimination, have also been included in these studies.

Race and ethnicity also play a role in the choice of treatment, the effectiveness of treatment and treatment outcomes of chronic diseases. The Institute of Medicine's 2002 report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*, highlighted studies assessing health disparities from each stage of the care process. Effectiveness of treatment was poor in many minority patients for a wide variety of reasons including low health literacy, mistrust in the provider, a history of unpleasant experiences with the health care system, poor knowledge on how to navigate the health care system, and poor provider-patient communication (IOM, 2002). Many non-white individuals delayed seeking necessary care, did not comply with treatment regimens, or sought care when a positive outcome was not likely (IOM, 2002).

Many studies find that the process of selecting the appropriate treatment for a patient is often a difficult one. Providers compare the risks and benefits for each treatment option while considering the individual patient's characteristics. Unfortunately, in many cases, this practice is tainted by clinical uncertainty, provider bias and perpetual stereotypes (Balsa and McGuire, 2003). Health professionals' interactions with patients and caregivers are influenced by their own views of race, ethnicity, gender, sexuality, socioeconomic status, and spirituality. These concepts--what social psychologists call "group characterizations"—can have a negative impact on the entire health care experience (Balsa and McGuire, 2003). It is a two way street, however. Minority patients' responses to healthcare providers can also be a source of disparities. Minority patients can convey mistrust of the health care system in general and individual providers. That mistrust can result in the refusal of treatment or affect medication taking behaviors, which in turn can lead to provider disengagement and less willingness to pursue vigorous treatment options (IOM, 2002).

In a study assessing breast cancer treatment choices by race, for example, patients who were African American, Mexican, and Puerto Rican were 20% to 50% more likely to receive or elect a treatment not meeting the national standard of care (Li et al, 2003). Mortality rates among these groups were also higher than white patients, although it has often been reported that non-white patients tend to seek medical treatment at later stages of disease and often only in emergent situations (Li et al, 2003).

Heart failure is another of many examples (Hawkins-Taylor and Carlson, 2013). Heart failure is suggested to manifest differently in black patients than in other races. The disease tends to occur due to the interplay of co-morbidities such as high blood pressure, high cholesterol, diabetes and poor management of those conditions. There are even instances of response differences to drug therapy for heart failure based on racial group. For instance, a retrospective analysis of Veterans Heart Failure Trial data in the 1990s, suggested that a fixed-dose combination of isosorbide dinitrate and hydralazine (later branded BiDil®) produced significantly better treatment outcomes when added to an established heart failure treatment protocol. These findings were later confirmed in the African American Heart Failure Trial in early 2004 and led to

a modification of heart failure guidelines to include this drug therapy as part of the treatment plan. These same studies identified diuretics as a more effective first-line therapy for black patients than the established ACE Inhibitor drug class (Hawkins, 2010; Hawkins-Taylor and Carlson, 2013).

Race and ethnicity indicators may also determine or explain perpetual disadvantages and barriers. Considering race disparities, African Americans live shorter lives than whites and this rate is even greater at younger ages. The death rate for Blacks between ages one to four and twenty-five to fifty-four is more than two times that of white individuals. While historical accounts suggest that the health disparities due to race may be attributed to underlying biological characteristics (Kriegar, 1987), the census data has shown that socioeconomic factors—housing, home ownership, education, employment status and poverty—all facilitate health gaps that persist among minority racial and ethnic groups.

The literature on racial disparities details the problems that constantly plague minority care seekers. Research not only brings to bear problems of access, inadequate treatment, and cultural biases, it also tells a frightening tale of unequal and unethical treatment. There are historical, documented instances of physicians, often motivated by social or political agendas, performing immoral and unethical acts without regard for the human beings who were subject to their experiments. In *The Immortal Life of Henrietta Lacks*, Rebecca Skloot identified experimentation on vulnerable, often minority patients, calling them “illegal, immoral, deplorable.” Skloot was referring to the long history of so-called clinical trials where the mistreatment of patients led to worsening disease states or death. She told the story of Henrietta Lacks and the unethical cultivating and use of her cells for research long after her death in 1951 (Skloot, 2010). Henrietta’s cells, known in the science community as “HeLa Cells,” are an immortal cell line whose scientific study has resulted in remarkable advances such as a vaccine for Polio, the development of chemotherapy as a course of cancer treatment, gene mapping among countless others (Skloot, 2010).

Among the abusive clinical trials, the most infamous of cruel and unethical schemes was the Tuskegee Syphilis Experiment where black men from Tuskegee, Alabama, infected with syphilis, were kept in hospital research settings and observed for symptoms, but were denied treatment long after a cure was discovered. Beginning in 1932, this experiment would continue for forty years without the affected being offered the curative penicillin. Discovery of this experiment was the turning point for the development of rules and standards for the responsible and ethical conduct of research and implementation of an institutional review board to approve studies regarding human subjects (Howard-Jones, 1982). This particular study is blamed for the reluctance of many African Americans to participate in clinical trials even today.

Henrietta Lacks and the Tuskegee trials are part of an unfortunate legacy of unethical treatment for research purposes in the United States. In the early 1900s to around the 1940s researchers were known to infect captives with infectious diseases such as cholera and bubonic plague. There was also a practice of starving prisoners of war to cause vitamin B-1 deficiency, ultimately resulting in the cardiac-affecting disease

beriberi. These scandals of the past, generations of discriminatory behavior towards minority groups, and a lack of transparency about medical research have led to a lack of trust between patients and their health care providers and far worse, a failure to seek care until conditions are exacerbated if care is sought at all.

The overall goal in addressing health disparities associated with race and ethnicity differences has always been to achieve fair and equitable treatment for all. The basic premise of the literature is that vulnerable groups receive lower quality health care often due to lack of health insurance, inadequate access to affordable care and numerous other complicating issues like language barriers, poor health literacy, stereotyping and bias that contribute to poor patient-provider communication.

AGE

Age is generally considered a demographic variable but as a social determinant it is a powerful driver of health and health care needs. Age is associated with cultural roles, social position and wealth, all of which impact access to important resources. Age is, therefore, a vital factor in determining a population's burden of disease.

Specific risk factors and determinants of health vary across the life span. An inability to reduce the burden of illness for a number of diseases and illnesses can be due to the influence of age in combination with other individual and social determinants of health that can accumulate over time. Social epidemiologists are challenged to identify specific points of intervention in the life course, a Life Span approach, and interventions that will reduce risk factors and promote health (Healthy People 2020). An example is the increasing prevalence of Type II diabetes, identified as a public health epidemic in the United States and world-wide. Interventions earlier in the lifespan to reduce childhood obesity and increase physical activity coupled with education about nutritional choices, improved access to nutritional resources, and preventive health care to monitor for known risk factors are all considered important strategies in efforts to address this epidemic.

At the same time there is a need to balance the competing needs of all age segments. As people age they require an increasingly larger share of health care funds, resources, and attention to address the age-related burden of chronic diseases. The political influence of older citizens is strong, and there are researchers who believe that, because of this political clout, health care programs will focus on elderly health care issues at the expense of the needs, primarily preventive, of younger generations. For proponents of health care rationing this larger share is problematic and they propose that Medicare refrain from paying for life-extending medical care in the late stages of life. These individuals argue that the economy is already taxed to capacity in its attempt to support life-extending therapeutics and technologies for the elderly and should only cover routine or palliative care (Callahan, 1996). Many have found this idea unethical. Before the implementation of the Affordable Care Act in 2013, health care rationing largely forced the unhealthy to pay higher costs for health services—the smoker, the obese, and the chronically ill, for instance paid more. Coincidentally, many in this unhealthy group were older individuals.

Rationing of healthcare was considered a concept of the 1990s, but there is actually a long history of health care policy decisions resulting in rationing, and the concept has been reborn in the dialog regarding health care reform. Supporters of health care rationing suggest giving greater support to the young who mostly require preventive care and can be more productive in society, in their opinion (Bowling, 1997). The challenge for public policy is the need to provide adequate opportunities to ensure the social well-being of all citizens (Knickman and Snell, 2002).

SEX, GENDER, AND SEXUAL ORIENTATION

Sex categories, male and female, are biologically and physiologically determined definitions of men and women while gender categories, masculine and feminine, are socially constructed self-characterizations of an individual (WHO, 2015). As social determinants, sex and gender classifications impact income earnings, social power and influence. They also impact access to health promoting resources, health prevention and care access, most often negatively impacting those identifying as feminine or woman. Numerous medical study and treatment practices are based on research done on males. Even the dynamics of social relationships are different among genders, considered more emotionally supportive among and more stressful among women (Umberson et al, 2014).

How sex and gender characterizations play out in society may have significant implications for health. The patterns of health and disease are different among men and women and therefore, must be understood and treated uniquely in the case of many chronic diseases. Considering women, it was not until the year 2000 with the launch of *The Heart Truth* campaign by the National Institutes of Health that heart disease, the leading cause of death among women, made this a priority for and about women (Long et al, 2008). Even today the campaign continues to increase awareness among women that heart disease is a primary death threat for them. It also encourages women to know their risk, speak to their physicians and take action. Before *The Heart Truth* campaign, heart disease was thought of as a man's disease and gave little attention to women as a priority group (Long et al, 2008).

In recent years, understanding of sex and gender differences has called for greater priority to be given to reframing health service delivery toward more gender sensitive care. There is a need to have practitioners care for patients with an eye toward biological characteristics, sexual orientation (heterosexual, homosexual, and transgender persons) and gender roles (Doyal, 2003). In the Lesbian, Gay, Bisexual and Transgender (LGBT) community efforts to improve care have focused on changing attitudes among practitioners and minimizing stereotypes and biases (Lim et al, 2014).

EDUCATION

Education or academic achievement is a social determinant that strongly influences other social elements impacting health. Some have called education the most impor-

tant social determinant of health because of its robust connection to and impact on health behaviors—diets, daily physical activity, attention to mind and body.

Level of education determines how well an individual will take care of basic health needs and take personal responsibility for their own health. From 2007–2010 higher levels of education for the head of household resulted in lower rates of obesity among boys and girls 2–19 years of age. In 2010, 31 percent of adults 25–64 years of age with a high school diploma or less education were current smokers, compared with 24 percent of adults with some college and 9 percent of adults with a bachelor's degree or higher.

Conversely, health may impact potential for academic achievement. Thus, the relationship between health and education goes in two directions (Ickovics et al, 2014). People with higher levels of education and higher income have lower rates of many chronic diseases according to a 2011 report of the CDC's National Center for Health Statistics. Reports suggest that students with disabilities or chronic diseases have poor academic achievement, and those who do not do well in school tend to have more comorbid conditions as adults and premature mortality (Fiscella and Kitzman, 2009). Even from an early age health and education are influenced by conditions such as school readiness, family structure and poverty level almost shaping an individual's destiny from the very start of life (Ickovics et al, 2014).

Besides school readiness and socioeconomic factors, indicators of education have included kindergarten to high school attendance and academic performance, high school graduation rates, college or post-secondary education and completion. The most used academic achievement indicator, however, is self-reported grades (often as grade point average), although recent studies have suggested that standardized test scores should be used instead (Ickovics et al, 2014). Regardless of how they are defined, academic influences are determinants of where employment status is attained, in what communities one lives, the social circle and social relationships that are formed and ultimately the socioeconomic status and planning for posterity. College graduates live at least five years longer than high school dropouts (RWJF, 2013). Similar studies suggest that higher achieving individuals are more likely to avoid common acute and chronic disease diagnoses such as heart disease and diabetes. This group is also less likely to struggle with weight issues and is more likely to lead healthy lifestyles (Burgard and Hawkins, 2014).

Given that academic achievement is associated with lifestyle, it would appear that health prevention methods during the formative academic years would have a positive impact on academic achievement. Indeed, healthy eating and regular physical exercise were associated with high cognitive functioning and academic success (Edwards et al, 2011). To the contrary, obesity and low activity level were associated with low cognitive functioning and lower overall achievement (Edwards et al, 2011). In a randomized, controlled trial, students participated in a short term exercise program. After just thirteen weeks, students showed increased brain functioning, execution function and mathematic achievement (Davis et al, 2011).

Recognition of the strong connection between education and health has recently led to a push for policy development promoting positive health practices as a means to improve academic proficiency in United States schools. First Lady Michelle

Obama's *Let's Move* campaign, launched in 2010 to address the growing epidemic of childhood obesity, targeted schools in efforts to promote healthier school foods and increased physical activity before, during and after school. Now five years since its inception schools nationwide have committed to making nutrition and fitness a priority to improve the health of all children (www.letsmove.gov). The Institute of Medicine 2012 report, *Accelerating Progress in Obesity Prevention*, evaluated obesity prevention strategies and concluded that we must "strengthen schools as the heart of health" (IOM, 2012).

SOCIAL GAPS IN THE DELIVERY OF HEALTH CARE

Health inequalities have been remarkably resistant to change or to geography, being demonstrated worldwide (McCartney et al, 2013). Acknowledgement of the theory of social determinants of health has challenged the field of epidemiology to more comprehensively assess the underlying reasons for the experience of disease and poor health. Individual characteristics and responsibility for health must be considered within a larger context of social, political and economic conditions. Populations are made up of individuals making personal choices about diet, exercise and smoking that are associated with chronic diseases like diabetes and hypertension. These individual decisions are made within a larger social context—as a member of a social group that may have a cultural propensity for rich, high-fat diets or, because they are living in a community with poor economic development characterized as a food desert, are limited in their access to nutritious foods. They may also be persons of racial or ethnic groups working in low-income jobs that do not provide adequate financial resources to afford more nutritious, but generally more expensive, foods.

The inequities in how society is organized means that the freedom to lead a flourishing life and to enjoy good health is unequally distributed between and within societies. The inequities are seen early—in access to prenatal care, in birth outcomes, and in the conditions of early childhood and schooling. They continue throughout the lifespan—in the nature of employment and working conditions, access to housing, and the quality of the natural environment in which people reside. Depending on the nature of these environments, different groups will have varied experiences of material conditions, psychosocial support, and behavioral options, which make them more or less vulnerable to poor health (WHO, 2008).

Since 1979, the federal *Healthy People* initiative has guided the United States' approach to improving population health. A new version of Healthy People is issued each decade and features updated goals and identifies topic areas and quantifiable objectives for health improvement for the succeeding ten years (Green and Fielding, 2011). The current version, *Healthy People 2020*, has been informed by the body of work on the role of disadvantage and health—how social and economic conditions affect our health and survival (Koh et al, 2011;Fielding et al, 2013). *Healthy People 2020* has been organized using a "Health Determinants and Health Outcomes by Life Stages" conceptual framework (Healthy People 2020). There are 12 Leading Health Indicator (LHI) topics that help draw attention to both individual and

societal determinants that affect the public's health and contribute to health disparities from infancy through old age (Healthy People 2020). These LHI topics include indicators addressing access to health services, environmental quality, injury and violence, nutrition/physical activity/obesity and educational attainment (Healthy People 2020).

ACHIEVING HEALTH EQUITY

Traditionally, society has looked to the health sector to deal with its concerns about health and disease. The focus of public policy has been directed at the delivery of health care and the dominant view of modern health care facilities as repair shops for bodies gone wrong. Policies directly aimed at a health concern will not be adequate to address the influences that the social determinants of health present. Even if the incidence and prevalence of disease were equally distributed among all social levels, the experience of the disease would be unequal due to the imbalance of the influences of the social determinants of health. Barriers that make it impossible for some persons to make healthy choices must be addressed (IOM, 2014).

Attention is now being focused on addressing the greater influences of the social determinants of health. To achieve health equity, action must involve the whole of government, civil society and local communities, business, and international agencies. Policies and programs must embrace all the key sectors of society—health and non-health sectors alike. The unequal distribution of health-damaging experiences is the result of a combination of poor social policies and programs, unfair economic arrangements, and politics (WHO, 2008). Agencies focused on transportation, the environment, consumer protection, and agriculture have an equal share in the responsibility for the health of society on a global basis (WHO, 2008; International Fund for Agriculture Development, 2011). To recognize this multi-layered, multi-factorial need, recent public health and social writing has introduced the concept of “Health in All Policies” (APHA, 2013).

Health in All Policies (HiAP) is often identified as multi-sectored and multi-layered because it is an approach to improve population health that should develop seamlessly from other initiatives and across government policy issues. A number of definitions of HiAP exist, but all have in common the considerations of health implications across policy sectors. Fully operationalizing HiAP requires new frameworks, leadership structures, processes and measurement. It requires a shared understanding of health determinants in non-health sectors such as transportation, environment, and agriculture. This movement requires the removal of the typical silo culture among government areas.

At its origins is a spirit of multi-sectored collaboration—alignment of interests and focus on health inequities (Storm et al, 2011). European countries, who are leaders in their commitment to a HiAP government approach, consider a broad vision of health and the influence of health in all governmental areas (Storm et al, 2011). HiAP is large scale action to improve health through attention to the full range of health determinants. It should develop seamlessly out of other initiatives that are not primarily health focused (Greaves and Bialystok, 2011). According to the leading

models, foundations of HiAP should include a strong cross-governmental focus; central government mandate and central coordination; flexible and adaptable methods of inquiry; mutual gain and collaboration; dedicated resources; and joint decision-making and accountability.

Fully operationalizing HiAP requires new organizational frameworks, leadership structures, processes and measures. It requires horizontal (cross-governmental) approaches and vertical (hierarchical) commitment. Addressing health through public policy makes health an all-encompassing goal for policymakers. All policies contribute to health in some way. Some, like the 2013 Affordable Care Act (ACA) in the United States, have a direct connection. The ACA has attempted to temper socioeconomic health determinants by improving access to health insurance and health services for economically disadvantaged families.

A primary goal of HiAP is to equip decision-makers with information about how choices made within *non-health policy* sectors also influence health and health equity (WHO, 2008; APHA, 2013). Policies that address minimum wage, safe work environments, housing for homeless and low-income persons, parenting leaves of absence, educational financing, environmental protection and even the regulation of lending practices have implications for health improvements because of their mediating effects on social determinants. Health disparities that lead to reduced productivity and premature death represent a substantial loss of talent that impacts all of society. Socioeconomic inequalities are also costly—more than \$1 trillion dollars per year to the US economy by some estimates (IOM, 2014).

DATA AND MEASUREMENT IN SOCIAL EPIDEMIOLOGY

Social epidemiologists and other researchers have had great difficulty investigating the role of the social determinants of health and other aspects of health care utilization and expenditures due to a lack of complete, timely, and large population-based surveillance data (Placzek and Madoff, 2014). Social structures continually change and so do health care systems, health care delivery and how health care is financed in response to demographic trends, political pressures and other forces.

The evolution of health information technology has changed the way social epidemiologists study the health of populations and the social factors that impact health care use (Barrowman, 2014). Social epidemiologists are not presented with opportunities to manipulate large-scale social influences or political factors to study outcomes (Galea and Link, 2013), so using what is now referred to as big data, researchers can study health outcomes and health care utilization on large groups of people by age, sex, geographic location, health insurance status and benefits, and other demographic characteristics over time. Large databases suitable for epidemiologic research are available from a number of sources. In the United States, population-based health surveys like the *Behavioral Risk Factor Surveillance System* (BRFSS), the *National Health Interview Survey* and the *National Health and Nutrition Examination Survey*, are available from the Centers for Disease Control and Prevention. Technology also allows social epidemiologists to combine information from large databases with

information recorded in national surveys and demographic information obtained from census reports and other sources of vital statistics.

Large databases offer social epidemiologists and other health service researchers a number of advantages. The data is more easily obtainable than collecting primary data for a single study and, therefore, the overall cost of conducting the research is less expensive. The number of patients that will meet study inclusion criteria is large and events that would otherwise go unnoticed may become visible. Large databases may offer, for instance, a chance to examine the health care utilization of persons with relatively uncommon health conditions and to obtain a better understanding of the health care services provided to them. Small populations that engage in unique health behaviors may emerge through modelling efforts with large databases and small clusters of illness and/or rare adverse events to medical treatments may also become noticeable.

In using large databases, however, it is important to remember that the data has usually been collected for purposes other than social epidemiology studies. Health insurance claims databases contain information about health service use for the purpose of providing payment to providers. Electronic medical record databases contain archival information about health encounters from the health provider perspective only; an EMR is both a patient care record and a detailed document to substantiate requests for payment. Census data is collected to provide an enumeration of a large population group and underlying demographic characteristics of that group. Large national health surveys have underlying purposes for the data gathering exercise defined by a government agency or a legislative need. Combining data from multiple sources that was collected for widely differing purposes can be problematic and raises questions about data ownership for the original and the enhanced data sets.

Conducting research on data collected for other purposes can also introduce problems with the interpretation of findings. Epidemiology studies are generally observational and, therefore, cannot demonstrate causality. While this is true for any observational study, the number of observations contained in large databases can lead to false assumptions about the truth of the findings; researchers who work with large databases must guard against interpretation of findings that go beyond the data, no matter how large it may be (Barrowman, 2014). With very large samples, relationships between variables can easily be statistically significant so that relying on p-values can lead to conclusion with no practical usefulness (Lin et al, 2013). Patterns that are identified in large databases may also be difficult to apply in clinical practice where the population of interest is much smaller. This area of social epidemiology efforts, called translational science, is still in its infancy.

Working with large databases also requires large capacity computing resources and the technical skills needed to manipulate the data. Computer technology has advanced significantly, increasing the ability to collect, download, analyze and report on extremely large numbers of health care occurrences. The application of privacy and security rules under the Health Insurance Portability and Accountability Act (HIPAA) must be carefully considered given the advances that have occurred. A balance between data security and data availability is delicate. The highly personal nature of the underlying patient-professional exchanges that lead to the data used to

study health care means that concerns about patient privacy and data security must be thoughtfully addressed (Neff, 2013).

Despite these concerns large databases provide an opportunity to identify underlying care delivery differences that exist between disparate social groups, geographic areas, health insurance status and other aspects of social structures. These differences, that in the past were hypothesized or shown to exist in smaller isolated population studies, are now readily visible in large databases and, as the results become more widely disseminated, will help inform our collective response to the unequal impact of the social determinants of health and the wide variation and quality of health care practices that are present today.

SUMMARY

This chapter presented a review of social epidemiology's focus on the root causes for differences in the experience of disease and illness by groups of people. Longstanding features of society—poverty, social class, gender, race, and culture—have been associated with differences in the incidence, prevalence, and the treatment of disease and illness. Other features—environmental, political and economic—carry differing weights of influence over time. These features of society, identified collectively as social determinants, impact the health of populations to differing degrees, however, the discipline of social epidemiology is founded on the assumption that all health outcomes are inextricably tied to social context. A full understanding of health problems and the etiology of disease requires a critical study of these social determinants of health, because a population's health care needs exist within an ever-changing social and environmental backdrop.

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