

P A R T

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# HEALTH OF THE NATION

Part I of the book presents the broad outcomes achieved by the health care system and a conceptual framework for understanding health determinants. This part consists of two critical areas represented by two chapters: health outcomes (Chapter 1) and conceptual framework of health determinants (Chapter 2). Chapter 1 focuses on the nation's health outcomes. After a summary of the U.S. achievements in combating behavior risks, health problems and disparities are highlighted, with particular attention to vulnerable populations. Since the United States is often compared to other nations in terms of its achievements and deficiencies, the concept of global health is also introduced. Chapter 2 introduces some dominant health determinants conceptual framework both international and domestic. The chapter also includes articles that illustrate what a conceptual framework is and how a conceptual framework might be used to understand health and healthcare problems and identify solutions. Part I provides the outcome measurement for the other parts of the book that address input and process respectively. Part I is also a foundation for the rest of the book, providing a "big-picture" view on how much we have accomplished and how much we have yet to achieve. A clear grasp of the materials in Part I will assist in developing a more comprehensive and balanced critique of the U.S. health care system.



## 1

# Health Outcomes

**T**he World Health Organization (WHO) defines health as “a complete state of physical, mental, and social well-being, and not merely the absence of disease or infirmity” (WHO 1948). Over the past century, the United States has made great strides in improving the health of its populations. Since 1900, the average lifespan of persons in the U.S. has lengthened by greater than 30 years and 25 years of this gain are attributable to advances in public health (CDC 1999). The ten public health achievements include vaccination, motor-vehicle safety, safer workplaces, control of infectious diseases, decline in deaths from coronary heart disease and stroke, safer and healthier foods, healthier mothers and babies, family planning, fluoridation of drinking water, and recognition of tobacco use as a health hazard.

Despite these achievements, the U.S. still ranks low among the developed nations in health status. Out of 30 developed nations in the Organization for Economic Cooperation and Development (OECD), the U.S. is near the bottom in all standard measures of health status (Schroeder 2007). In 2004, the U.S. ranked 46th in life expectancy and 42nd in infant mortality out of 192 nations. While it is true that there

are wide discrepancies in the health status of populations within the country, comparing only the health status of white Americans to other countries produced the same dismal results. White Americans are still doing worse than other developed nations for all standard measures of health status. The U.S. also has one of the highest amenable death rates, defined as mortality caused by bacterial infections, treatable cancers, diabetes, cardiovascular disease, cerebrovascular disease, and complications from common surgical procedures (Nolte and McKee 2008). Comparing 50-to-74-year-old Americans to Europeans while adjusting for wealth still placed Americans at worse health than the Europeans (Davies et al. 2007). While Americans were worse off for all levels of health, the discrepancy between Americans and Europeans were worst for poor Americans.

Yet, the U.S. has by far the most costly health system in the world, using up 17 percent of the country’s gross domestic product, and has the highest rate of specialist physicians per capita (Davies et al. 2007; Simms 2009). Both physicians and patients consistently provide low ratings to the health care system, with reports of facing numerous barriers to care as well

as inadequacies of insurance coverage. Compared to other countries, U.S. patients pay much more out of pocket for their medical expenses and are less likely to have a regular source of care, which then affects getting timely care (Avendano et al 2009).

In addition, the health status of individuals in the U.S. is mired with inequalities and disparities as a result of numerous factors, including but not limited to socioeconomic status (SES), race/ethnicity, and insurance coverage. SES most commonly incorporates measures of income, education, and occupation. An unfortunate truism in the U.S., and in nearly every other developed country, is that individuals with higher SES have better health. They also have greater ability to access health services and obtain better quality care. SES is related to health and health care in two ways that have been previously labeled material deprivation and lack of social participation (Marmot 2002). Material deprivation includes access to material goods that are required for good health, including clean water and good sanitation, adequate nutrition and housing, reliable transportation, and a safe and comfortable environment. Social participation includes having time for leisure activity and group participation, having friends or family around for entertainment and support, opportunities for professional achievement, and ultimately having sufficient control over one's life that leads to fulfillment and satisfaction. Without access to material goods and supportive social participation, health may falter, and greater barriers may be experienced in obtaining needed health care services.

One of the most prominent inequalities within the U.S. health care system is defined by race (Davies et al. 2007; Blendon et al. 2007). However, race/ethnicity frequently serves as a proxy measure for other factors that are more appropriate explanatory factors than skin color. Race/ethnicity can be a reflection of biological factors; socioeconomic status; cultural practices, beliefs, or acculturation; or political factors (King and Williams 1995). Race/ethnicity may also serve as a proxy measure of experiencing discrimination. In the case of health outcomes, race/ethnicity may serve as a proxy for biological factors (blacks are more prone to sickle cell anemia, for example), cultural behaviors or practices regarding health, or access to material goods and services that support health. In the case of health care experiences, race/ethnicity may serve as a proxy for socioeconomic factors (enabling the purchase of services), language factors (creating barriers to accessing services), or discrimination based on skin color.

Until recently, the U.S. was the only developed nation that does not guarantee its citizens access to

health care through a system of universal health coverage. In 2000, WHO released a report ranking countries on the quality of their health systems. The report placed the U.S. in the 37th spot for health system performance and 72nd for health outcome performance (out of 191), primarily because of its failure to ensure access to primary care for the uninsured and because of the relatively low life expectancy and high infant mortality despite the fact that the U.S. spends more than all the other nations on health care (World Health Organization 2000). With the exception of individuals living in close proximity to free health care clinics or community health centers, the uninsured are particularly vulnerable to financial barriers in accessing health care (Kronick 2009; Levy and Meltzer 2008). Once a person is insured, there are three mechanisms by which insurance may be related to health and health care experiences: (1) health plan policies may affect care-seeking and cost-sharing behaviors of beneficiaries, (2) providers' incentives and reimbursement strategies may influence provider behavior, and (3) perceptions of health insurance plans may create feelings of stigma and affect the use of services and reports of quality.

This chapter focuses on the nation's health. After summarizing our achievements in combating behavior risks, we highlight our health problems and disparities, particularly for one of the most vulnerable populations, the American Indians. Since the United States is often compared to other nations in terms of its achievements and deficiencies, the concept of global health is also introduced. Below are synopses of the readings included for this chapter.

In *We Can Do Better—Improving the Health of the American People*, the author points out that the greatest opportunity to improve the health of Americans and reduce the number of premature deaths lies in personal behavior. History has shown this as a possible solution. There has been a marked increase in the use of seatbelts in the last couple of decades, and recently, Americans have decreased their high consumption of saturated fats. There was also the rapid fall of tobacco use from the mid-1960s to the present with the help of laws, regulations, and litigations, including smoke-free public areas and increased tax on cigarettes.

The next problem to be tackled will be obesity, which poses the same obstacles smoking once did on the population. The largest hurdle in dealing with the obesity epidemic is the use of BMI to classify obesity, since the method often misclassifies individuals with large amounts of muscle mass as obese. Litigation is also more difficult since the food industry is not as concentrated as the tobacco industry.

There are more stakeholders involved in the food industry.

Improving population health also requires using non-behavioral determinants of health, such as social and environmental factors. Class, as defined by income, total wealth, education, employment, and residential neighborhood, is often an ignored determinant of health, despite obvious gradients in health among members of different social classes. The United Kingdom is at the forefront of addressing effects of class on health. In 1998, they placed the Acheson Commission in charge of reducing health disparities, focusing particularly on social policies for health care, which is absent in the U.S. health care policy framework. Access and quality of care can also influence the health status of a population. The U.S. trails in access to care with 45 million people lacking insurance and several million more underinsured. Lack of insurance or insufficient insurance often leads to poor health because it limits an individual's access to the health care system.

It is difficult to improve population health in the U.S. for several reasons. The system focuses on the health of the middle and upper class, more so than it does on the affected poor with worse health outcomes. Most progress in health care only occurs when the middle class takes action and brings the problem to the forefront. One of the reasons for this is that the poor have no representation in politics. There is no active labor movement in the U.S., unlike other developed nations. In addition, it is difficult to increase the role of U.S. government in health care due to the American culture of individual responsibility that results in reluctance to intervene.

In **U.S. Disparities in Health: Descriptions, Causes, and Mechanisms**, the authors cite Healthy People 2010's definition of "health disparities" as differences that occur by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation. Disparities in race/ethnicity have been shown in certain diseases. Compared to whites, blacks have higher standard mortality rates (SMR) for homicides, hypertensive heart disease, esophageal cancer, and pulmonary circulation, and lower SMRs for suicide, leukemia, and COPD. Socioeconomic status (SES) has been found to contribute to a large portion of racial/ethnic disparities. A gradient within the SES correlates to a gradient in health outcomes with lower SES associated with poorer health.

Disparities have also been known to change over a life course. There are higher disparities among infants at birth depending on their mother's education, income, and lifestyle behaviors, but these disparities

drop off during childhood, adolescence, and young adulthood. Disparities widen once again during middle age and finally decrease in older populations, most likely as a result of the "weaker" individuals in the population dying off at earlier ages to leave a healthier population at this late stage of life.

In **Changing Patterns of Mortality Among American Indians**, the authors note that the mortality rates of American Indians have shown an alarmingly increasing trend in recent years. For the Navajos, the largest tribe living on a reservation, the mortality rate began to increase at 46 per 100,000 individuals since the mid-1980s, while whites continued to decrease their rates within that same time period. The major source of mortality came from lung cancer, diabetes, and cardiovascular disease while there were decreases in deaths caused by infectious diseases. Morbidity among Navajos saw an increase in non-insulin-dependent diabetes as a result of the increasing rates of obesity made worse by changes in diet and activity patterns. Access to screening and prevention services is limited to the Navajo community. The best solutions to tackle the growing problem of mortality from chronic conditions within this population are primary prevention, i.e., the prevention or reduction of the underlying causes of risk factors. In addition, implementing a broad range of services, rather than only health services, may be better at solving chronic diseases.

In **Towards a Common Definition of Global Health**, the authors start by reviewing two related terms: public health and international health. Public health emerged in Europe and the United States from social reforms and an increased understanding of medicine, including a better understanding of the causes and treatments of infectious diseases. Public health has four important factors: (1) evidence-based decisions, (2) a focus on population care, rather than individual needs, (3) an emphasis on seeking social justice and equity, and (4) prevention rather than treatment. International health focuses on health care abroad, relating more to health practices, policies and systems, and stressing differences among countries. Public health is applied to international health as a means to fix the problems and challenges that affect mostly low-income or middle-income countries.

Global health is considered a mixture of both public health and international health. It focuses on problems with an international scope, rather than where the problem exists, embracing all health threats in addition to infectious diseases and maternal and child care that are problems in low-income and middle-income countries. Important topics in global health consist of under- and over-nutrition,

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HIV/AIDS, tobacco use, malaria, and mental health. While global health emphasizes prevention, it also covers aspects of clinical medicine, including treatment and rehabilitation. The proposed definition of global health states that “global health is an area for study, research, practice that places a priority on improving health and achieving equity in health for all people worldwide . . . emphasizing transnational health issues, determinants, and solutions involving many disciplines within and beyond the health sciences and promotes interdisciplinary collaboration synthesis of population-based prevention with individual clinician care.”

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# We Can Do Better—Improving the Health of the American People

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The United States spends more on health care than any other nation in the world, yet it ranks poorly on nearly every measure of health status. How can this be? What explains this apparent paradox?

The two-part answer is deceptively simple—first, the pathways to better health do not generally depend on better health care, and second, even in those instances in which health care is important, too many Americans do not receive it, receive it too late, or receive poor-quality care. In this lecture, I first summarize where the United States stands in international rankings of health status. Next, using the concept of determinants of premature death as a key measure of health status, I discuss pathways to improvement, emphasizing lessons learned from tobacco control and acknowledging the reality that better health (lower mortality and a higher level of functioning) cannot be achieved without paying greater attention to poor Americans. I conclude with speculations on why we have not focused on improving health in the United States and what it would take to make that happen.

## HEALTH STATUS OF THE AMERICAN PUBLIC

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Among the 30 developed nations that make up the Organization for Economic Cooperation and Development (OECD), the United States ranks near the bottom on most standard measures of health status (Table 1).<sup>1-4</sup> (One measure on which the United States does better is life expectancy from the age of 65 years, possibly reflecting the comprehensive health insurance provided for this segment of the population.) Among the 192 nations for which 2004 data are available, the United States ranks 46th in average life expectancy from birth and 42nd in infant mortality.<sup>5,6</sup> It is remarkable how complacent the public and the medical profession are in their acceptance of these unfavorable comparisons, especially in light of how carefully we track health-systems measures, such as the size of the budget for the National Institutes of Health, trends in national spending on health, and the number of Americans who lack health insurance. One reason for the complacency may be the rationalization that the United States is more ethnically heterogeneous than the nations at the top of the rankings, such as Japan, Switzerland, and Iceland. It is true that within the United States there are large disparities in health status—by geographic area, race and ethnic group, and class.<sup>7-9</sup> But even when comparisons are limited to white Americans, our performance is dismal (Table 1). And even if the health status of white Americans matched that in the leading nations, it would still be incumbent on us to improve the health of the entire nation.

**Table 1** Health Status of the United States and Rank among the 29 Other OECD Member Countries

Health-Status Measure	United States	U.S. Rank Country in OECD*	Top-Ranked in OECD
Infant mortality (first year of life), 2001			
All races	6.8 deaths/ 1000 live births	25	Iceland (2.7 deaths/ 1000 live births)
Whites only	5.7 deaths/ 1000 live births	22	
Maternal mortality, 2001†			
All races	9.9 deaths/ 100,000 births	22	Switzerland (1.4 deaths/ 100,000 births)
Whites only	7.2 deaths/ 100,000 births	19	
Life expectancy from birth, 2003			
All women	80.1 yr	23	Japan (85.3 yr)
White women	80.5 yr	22	
All men	74.8 yr	22	Iceland (79.7 yr)
White men	75.3 yr	19	
Life expectancy from age 65, 2003‡			
All women	19.8 yr	10	Japan (23.0 yr)
White women	19.8 yr	10	
All men	16.8 yr	9	
White men	16.9 yr	9	

\*The number in parentheses is the value for the indicated health-status measure.

†OECD data for five countries are missing.

‡OECD data for six countries are missing.

## PATHWAYS TO IMPROVING POPULATION HEALTH

Health is influenced by factors in five domains—genetics, social circumstances, environmental exposures, behavioral patterns, and health care (Fig. 1).<sup>10,11</sup> When it comes to reducing early deaths, medical care has a relatively minor role. Even if the entire U.S. population had access to excellent medical care—which it does not—only a small fraction of these deaths could be prevented. The single greatest opportunity to improve health and reduce premature deaths lies in personal behavior. In fact, behavioral causes account for nearly 40% of all deaths in the United States.<sup>12</sup> Although there has been disagreement over the actual number of deaths that can be attributed to obesity and physical inactivity combined, it is clear that this pair of factors and smoking are the top two behavioral causes of premature death (Fig. 2, not included).<sup>12</sup>

### Addressing Unhealthy Behavior

Clinicians and policymakers may question whether behavior is susceptible to change or whether attempts

to change behavior lie outside the province of traditional medical care.<sup>13</sup> They may expect future successes to follow the pattern whereby immunization and antibiotics improved health in the 20th century. If the public's health is to improve, however, that improvement is more likely to come from behavioral change than from technological innovation. Experience demonstrates that it is in fact possible to change behavior, as illustrated by increased seat-belt use and decreased consumption of products high in saturated fat. The case of tobacco best demonstrates how rapidly positive behavioral change can occur.

### The Case of Tobacco

The prevalence of smoking in the United States declined among men from 57% in 1955 to 23% in 2005 and among women from 34% in 1965 to 18% in 2005.<sup>14,15</sup> Why did tobacco use fall so rapidly? The 1964 report of the surgeon general, which linked smoking and lung cancer, was followed by multiple reports connecting active and passive smoking to myriad other diseases. Early antismoking advocates, initially isolated, became emboldened by the cascade



of scientific evidence, especially with respect to the risk of exposure to secondhand smoke. Counter-marketing—first in the 1960s and more recently by several states and the American Legacy Foundation’s “truth®” campaign—linked the creativity of Madison Avenue with messages about the duplicity of the tobacco industry to produce compelling anti-smoking messages<sup>16</sup> (an antismoking advertisement is available with the full text of this article at [www.nejm.org](http://www.nejm.org)). Laws, regulations, and litigation, particularly at the state and community levels, led to smoke-free public places and increases in the tax on cigarettes—two of the strongest evidence-based tobacco-control measures.<sup>14,17,18</sup> In this regard, local governments have been far ahead of the federal government, and they have inspired European countries such as Ireland and the United Kingdom to make public places smoke-free.<sup>14,19</sup> In addition, new medications have augmented face-to-face and telephone counseling techniques to increase the odds that clinicians can help smokers quit.<sup>15,20,21</sup>

It is tempting to be lulled by this progress and shift attention to other problems, such as the obesity epidemic. But there are still 44.5 million smokers in the United States, and each year tobacco use kills 435,000 Americans, who die up to 15 years earlier than nonsmokers and who often spend their final years ravaged by dyspnea and pain.<sup>14,20</sup> In addition, smoking among pregnant women is a major contributor to premature births and infant mortality.<sup>20</sup> Smoking is increasingly concentrated in the lower socioeconomic classes and among those with mental illness or problems with substance abuse.<sup>15,22,23</sup> People with chronic mental illness die an average of 25 years earlier than others, and a large percentage of those years are lost because of smoking.<sup>24</sup> Estimates from the Smoking Cessation Leadership Center at the University of California at San Francisco, which are based on the high rates and intensity (number of cigarettes per day plus the degree to which each is finished) of tobacco use in these populations, indicate that as many as 200,000 of the 435,000 Americans who die prematurely each year from tobacco-related deaths are people with chronic mental illness, substance-abuse problems, or both.<sup>22,25</sup> Understanding why they smoke and how to help them quit should be a key national research priority. Given the effects of smoking on health, the relative inattention to tobacco by those federal and state agencies charged with protecting the public health is baffling and disappointing.

The United States is approaching a “tobacco tipping point”—a state of greatly reduced smoking prevalence. There are already low rates of smoking in some segments of the population, including physi-

cians (about 2%), people with a postgraduate education (8%), and residents of the states of Utah (11%) and California (14%).<sup>25</sup> When Kaiser Permanente of northern California implemented a multisystem approach to help smokers quit, the smoking rate dropped from 12.2% to 9.2% in just 3 years.<sup>25</sup> Two basic strategies would enable the United States to meet its Healthy People 2010 tobacco-use objective of 12% population prevalence: keep young people from starting to smoke and help smokers quit. Of the two strategies, smoking cessation has by far the larger short-term impact. Of the current 44.5 million smokers, 70% claim they would like to quit.<sup>20</sup> Assuming that one half of those 31 million potential non-smokers will die because of smoking, that translates into 15.5 million potentially preventable premature deaths.<sup>20,26</sup> Merely increasing the baseline quit rate from the current 2.5% of smokers to 10%—a rate seen in placebo groups in most published trials of the new cessation drugs—would prevent 1,170,000 premature deaths. No other medical or public health intervention approaches this degree of impact. And we already have the tools to accomplish it.<sup>14,27</sup>

### *Is Obesity the Next Tobacco?*

Although there is still much to do in tobacco control, it is nevertheless touted as a model for combating obesity, the other major, potentially preventable cause of death and disability in the United States. Smoking and obesity share many characteristics (Table 2). Both are highly prevalent, start in childhood or adolescence, were relatively uncommon until the first (smoking) or second (obesity) half of the 20th century, are major risk factors for chronic disease, involve intensively marketed products, are more common in low socioeconomic classes, exhibit major regional variations (with higher rates in southern and poorer states), carry a stigma, are difficult to treat, and are less enthusiastically embraced by clinicians than other risk factors for medical conditions.

Nonetheless, obesity differs from smoking in many ways (Table 2). The binary definition of smoking status (smoker or nonsmoker) does not apply to obesity. Body-mass index, the most widely used measure of obesity, misclassifies as overweight people who have large muscle mass, such as California governor Arnold Schwarzenegger. It is not biologically possible to stop eating, and unlike moderate smoking, eating a moderate amount of food is not hazardous. There is no addictive analogue to nicotine in food. Nonsmokers mobilize against tobacco because they fear injury from secondhand exposure, which is not a peril that attends obesity. The food industry is less concentrated than the tobacco

Characteristic	Tobacco	Obesity
High prevalence	Yes	Yes
Begins in youth	Yes	Yes
20th-century phenomenon	Yes	Yes
Major health implications	Yes	Yes
Heavy and influential industry promotion	Yes	Yes
Inverse relationship to socioeconomic class	Yes	Yes
Major regional variations	Yes	Yes
Stigma	Yes	Yes
Difficult to treat	Yes	Yes
Clinician antipathy	Yes	Yes
Relative and debatable definition	No	Yes
Cessation not an option	No	Yes
Chemical addictive component	Yes	No
Harmful at low doses	Yes	No
Harmful to others	Yes	No
Extensively documented industry duplicity	Yes	No
History of successful litigation	Yes	No
Large cash settlements by industry	Yes	No
Strong evidence base for treatment	Yes	No
Economic incentives available	Yes	Yes
Economic incentives in place	Yes	No
Successful counter-marketing campaigns	Yes	No

industry, and although its advertising for children has been criticized as predatory and its ingredient-labeling practices as deceptive, it has yet to fall into the ill repute of the tobacco industry. For these reasons, litigation is a more problematic strategy, and industry payouts—such as the Master Settlement Agreement between the tobacco industry and 46 state attorneys general to recapture the Medicaid costs of treating tobacco-related diseases—are less likely.<sup>14</sup> Finally, except for the invasive option of bariatric surgery, there are even fewer clinical tools available for treating obesity than there are for treating addiction to smoking.

Several changes in policy have been proposed to help combat obesity.<sup>28-30</sup> Selective taxes and subsidies could be used as incentives to change the foods that are grown, brought to market, and consumed, though the politics involved in designating favored and penalized foods would be fierce.<sup>31</sup> Restrictions could also apply to the use of food stamps. Given recent data indicating that children see from 27 to 48 food advertisements for each 1 promoting fitness or nutrition, regulations could be put in place to shift that balance or to mandate support for sustained social-marketing efforts such as the “truth<sup>®</sup>” campaign

against smoking.<sup>16,32</sup> Requiring more accurate labeling of caloric content and ingredients, especially in fast-food outlets, could make customers more aware of what they are eating and induce manufacturers to alter food composition. Better pharmaceutical products and counseling programs could motivate clinicians to view obesity treatment more enthusiastically. In contrast to these changes in policy, which will require national legislation, regulation, or research investment, change is already underway at the local level. Some schools have banned the sale of soft drinks and now offer more nutritionally balanced lunches. Opportunities for physical activity at work, in school, and in the community have been expanded in a small but growing number of locations.

### Nonbehavioral Causes of Premature Death

Improving population health will also require addressing the nonbehavioral determinants of health that we can influence: social, health care, and environmental factors. (To date, we lack tools to change our genes, although behavioral and environmental factors can modify the expression of genetic risks such as obesity.) With respect to social factors, people with lower socioeconomic status die earlier and have more disability than those with higher socioeconomic status, and this pattern holds true in a stepwise fashion from the lowest to the highest classes.<sup>33-38</sup> In this context, class is a composite construct of income, total wealth, education, employment, and residential neighborhood. One reason for the class gradient in health is that people in lower classes are more likely to have unhealthy behaviors, in part because of inadequate local food choices and recreational opportunities. Yet even when behavior is held constant, people in lower classes are less healthy and die earlier than others.<sup>33-38</sup> It is likely that the deleterious influence of class on health reflects both absolute and relative material deprivation at the lower end of the spectrum and psychosocial stress along the entire continuum. Unlike the factors of health care and behavior, class has been an “ignored determinant of the nation’s health.”<sup>33</sup> Disparities in health care are of concern to some policymakers and researchers, but because the United States uses race and ethnic group rather than class as the filter through which social differences are analyzed, studies often highlight disparities in the receipt of health care that are based on race and ethnic group rather than on class.

But aren’t class gradients a fixture of all societies? And if so, can they ever be diminished? The fact is that nations differ greatly in their degree of

social inequality and that—even in the United States—earning potential and tax policies have fluctuated over time, resulting in a narrowing or widening of class differences. There are ways to address the effects of class on health.<sup>33</sup> More investment could be made in research efforts designed to improve our understanding of the connection between class and health. More fundamental, however, is the recognition that social policies involving basic aspects of life and well-being (e.g., education, taxation, transportation, and housing) have important health consequences. Just as the construction of new buildings now requires environmental-impact analyses, taxation policies could be subjected to health-impact analyses. When public policies widen the gap between rich and poor, they may also have a negative effect on population health. One reason the United States does poorly in international health comparisons may be that we value entrepreneurialism over egalitarianism. Our willingness to tolerate large gaps in income, total wealth, educational quality, and housing has unintended health consequences. Until we are willing to confront this reality, our performance on measures of health will suffer.

One nation attempting to address the effects of class on health is the United Kingdom. Its 1998 Acheson Commission, which was charged with reducing health disparities, produced 39 policy recommendations spanning areas such as poverty, income, taxes and benefits, education, employment, housing, environment, transportation, and nutrition. Only 3 of these 39 recommendations pertained directly to health care: all policies that influence health should be evaluated for their effect on the disparities in health resulting from differences in socioeconomic status; a high priority should be given to the health of families with children; and income inequalities should be reduced and living standards among the poor improved.<sup>39</sup> Although implementation of these recommendations has been incomplete, the mere fact of their existence means more attention is paid to the effects of social policies on health. This element is missing in U.S. policy discussions—as is evident from recent deliberations on income-tax policy.

Although inadequate health care accounts for only 10% of premature deaths, among the five determinants of health (Fig. 1, not included), health care receives by far the greatest share of resources and attention. In the case of heart disease, it is estimated that health care has accounted for half of the 40% decline in mortality over the past two decades.<sup>40</sup> (It may be that exclusive reliance on international mortality comparisons shortchanges the results of America's health care system. Perhaps the

high U.S. rates of medical technology use translate into comparatively better function. To date, there are no good international comparisons of functional status to test that theory, but if it could be substantiated, there would be an even more compelling claim for expanded health insurance coverage.) U.S. expenditures on health care in 2006 were an estimated \$2.1 trillion, accounting for 16% of our gross domestic product.<sup>41</sup> Few other countries even reach double digits in health care spending.

There are two basic ways in which health care can affect health status: quality and access. Although qualitative deficiencies in U.S. health care have been widely documented,<sup>42</sup> there is no evidence that its performance in this dimension is worse than that of other OECD nations. In the area of access, however, we trail nearly all the countries: 45 million U.S. citizens (plus millions of immigrants) lack health insurance, and millions more are seriously underinsured. Lack of health insurance leads to poor health.<sup>43</sup> Not surprisingly, the uninsured are disproportionately represented among the lower socioeconomic classes.

Environmental factors, such as lead paint, polluted air and water, dangerous neighborhoods, and the lack of outlets for physical activity also contribute to premature death. People with lower socioeconomic status have greater exposure to these health-compromising conditions. As with social determinants of health and health insurance coverage, remedies for environmental risk factors lie predominantly in the political arena.<sup>44</sup>

## THE CASE FOR CONCENTRATING ON THE LESS FORTUNATE

Since all the actionable determinants of health—personal behavior, social factors, health care, and the environment—disproportionately affect the poor, strategies to improve national health rankings must focus on this population. To the extent that the United States has a health strategy, its focus is on the development of new medical technologies and support for basic biomedical research. We already lead the world in the per capita use of most diagnostic and therapeutic medical technologies, and we have recently doubled the budget for the National Institutes of Health. But these popular achievements are unlikely to improve our relative performance on health. It is arguable that the status quo is an accurate expression of the national political will—a relentless search for better health among the middle and upper classes. This pursuit is also evident in how

we consistently outspend all other countries in the use of alternative medicines and cosmetic surgeries and in how frequently health “cures” and “scares” are featured in the popular media.<sup>45</sup> The result is that only when the middle class feels threatened by external menaces (e.g., secondhand tobacco smoke, bioterrorism, and airplane exposure to multidrug-resistant tuberculosis) will it embrace public health measures. In contrast, our investment in improving population health—whether judged on the basis of support for research, insurance coverage, or government-sponsored public health activities—is anemic.<sup>46-48</sup> Although the Department of Health and Human Services periodically produces admirable population health goals—most recently, the Healthy People 2010 objectives<sup>49</sup>—no government department or agency has the responsibility and authority to meet these goals, and the importance of achieving them has yet to penetrate the political process.

### WHY DON'T AMERICANS FOCUS ON FACTORS THAT CAN IMPROVE HEALTH?

The comparatively weak health status of the United States stems from two fundamental aspects of its political economy. The first is that the disadvantaged are less well represented in the political sphere here than in most other developed countries, which often have an active labor movement and robust labor parties. Without a strong voice from Americans of low socioeconomic status, citizen health advocacy in the United States coalesces around particular illnesses, such as breast cancer, human immunodeficiency virus infection and the acquired immunodeficiency syndrome (HIV–AIDS), and autism. These efforts are led by middle-class advocates whose lives have been touched by the disease. There have been a few successful public advocacy campaigns on issues of population health—efforts to ban exposure to secondhand smoke or to curtail drunk driving—but such efforts are relatively uncommon.<sup>44</sup> Because the biggest gains in population health will come from attention to the less well off, little is likely to change unless they have a political voice and use it to argue for more resources to improve health-related behaviors, reduce social disparities, increase access to health care, and reduce environmental threats. Social advocacy in the United States is also fragmented by our notions of race and class.<sup>33</sup> To the extent that poverty is viewed as an issue of racial injustice, it ignores the many whites who are poor, thereby reducing the ranks of potential advocates.

The relatively limited role of government in the U.S. health care system is the second explanation. Many are familiar with our outlier status as the only developed nation without universal health care coverage.<sup>50</sup> Less obvious is the dispersed and relatively weak status of the various agencies responsible for population health and the fact that they are so disconnected from the delivery of health services. In addition, the American emphasis on the value of individual responsibility creates a reluctance to intervene in what are seen as personal behavioral choices.

### HOW CAN THE NATION'S HEALTH IMPROVE?

Given that the political dynamics of the United States are unlikely to change soon and that the less fortunate will continue to have weak representation, are we consigned to a low-tier status when it comes to population health? In my view, there is room for cautious optimism. One reason is that despite the epidemics of HIV–AIDS and obesity, our population has never been healthier, even though it lags behind so many other countries. The gain has come from improvements in personal behavior (e.g., tobacco control), social and environmental factors (e.g., reduced rates of homicide and motor-vehicle accidents and the introduction of fluoridated water), and medical care (e.g., vaccines and cardiovascular drugs). The largest potential for further improvement in population health lies in behavioral risk factors, especially smoking and obesity. We already have tools at hand to make progress in tobacco control, and some of these tools are applicable to obesity. Improvement in most of the other factors requires political action, starting with relentless measurement of and focus on actual health status and the actions that could improve it. Inaction means acceptance of America's poor health status.

Improving population health would be more than a statistical accomplishment. It could enhance the productivity of the workforce and boost the national economy, reduce health care expenditures, and most important, improve people's lives. But in the absence of a strong political voice from the less fortunate themselves, it is incumbent on health care professionals, especially physicians, to become champions for population health. This sense of purpose resonates with our deepest professional values and is the reason why many chose medicine as a profession. It is also one of the most productive expressions of patriotism. Americans take great pride in asserting that we are number one in terms of wealth,

number of Nobel Prizes, and military strength. Why don't we try to become number one in health?

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## U.S. Disparities in Health: Descriptions, Causes, and Mechanisms

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*Source:* Adler NE, Rehkopf DH. U.S. disparities in health: descriptions, causes, and mechanisms. *Annu Rev Public Health* 2008;29:235-52.

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### ABSTRACT

Eliminating health disparities is a fundamental, though not always explicit, goal of public health research and practice. There is a burgeoning literature in this area, but a number of unresolved issues remain. These include the definition of what constitutes a disparity, the relationship of different bases of disadvantage, the ability to attribute cause from association, and the establishment of the mechanisms by which social disadvantage affects biological processes that get into the body, resulting in disease. We examine current definitions and empirical research on health disparities, particularly disparities associated with race/ethnicity and socioeconomic status, and discuss data structures and analytic strategies that allow causal inference about the health impacts of these and associated factors. We show that although health is consistently worse for individuals with few resources and for blacks as compared with whites, the extent of health disparities varies by outcome, time, and geographic location within the United States. Empirical work also demonstrates the importance of a joint consideration of

race/ethnicity and social class. Finally, we discuss potential pathways, including exposure to chronic stress and resulting psychosocial and physiological responses to stress, that serve as mechanisms by which social disadvantage results in health disparities.

### INTRODUCTION

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Few terms have had such a meteoric rise into common usage in the health literature as has “health disparities.” In the 1980s this was a key word in only one article, and in the 1990s there were fewer than 30 such articles. In contrast, during the five years from 2000 through 2004, more than 400 such articles appeared.<sup>3</sup> An equivalent increase occurred in the number of articles containing the key term of “health inequalities.” Prior to this time, there was substantial work on the problem of health disparities, but it was usually framed in terms of specific factors such as race or poverty.<sup>60</sup>

One of the first uses of the term inequality with respect to health differences was in the title of the Working Group on Inequalities in Health, which issued the Black Report in Great Britain in 1980. In advance, it seemed likely that the working group would find reductions in social class differences in mortality following the provision of universal health care through the National Health Service. However, they found that the gap between the health of low and high social class individuals had actually

widened. Around the same time, the Whitehall Study of British Civil Servants<sup>68</sup> revealed significant differences in cardiovascular disease and mortality<sup>69</sup> by occupational level within a population of office-based workers. Notably, differences were not just between those at the top and bottom. Rather, disease prevalence and mortality increased at each step down in occupational grade. Spurred by these and other data, another commission, the Independent Inquiry into Inequalities in Health, made recommendations for policies in Great Britain to reduce health inequalities.<sup>2</sup>

During this period, research on socioeconomic and racial/ethnic differences in health was also being conducted in the United States. Beginning in the 1970s, investigators linked death records to socioeconomic data from the Current Population Study, to the U.S. Census, and to Social Security Administration records. The findings documented at a nationwide level substantially higher age-adjusted mortality rates for nonwhites, individuals with less education, individuals with low incomes, and for some occupational categories.<sup>16,58,59</sup> These data and the British findings provided an impetus to determine the extent and nature of health disparities in the United States and identify ways to reduce them. Efforts have included a report from the National Center for Health Statistics on differences in mortality and morbidity by socioeconomic status,<sup>80</sup> *Healthy People 2010*,<sup>100</sup> which established the goal of eliminating health disparities in addition to the goal of improving health, and the passage of the Minority Health and Health Disparities Research and Education Act of 2000. This legislation established the National Center on Minority Health and Health Disparities to coordinate activities among the NIH institutes. The Institute of Medicine recently reviewed the NIH plan and made a number of recommendations to improve its effectiveness.<sup>99</sup>

As reflected in the dual goals of *Healthy People 2010*, public health research and practice aim both to improve health and to eliminate disparities. Previous papers in the *Annual Review of Public Health* have examined substantive and methodological aspects of specific types of disparities. Some reviews concerned measurement issues and health effects of poverty, class, and/or socioeconomic status (e.g.,<sup>1,36,61</sup>), of race and ethnicity (e.g.,<sup>64,70,105</sup>), and of rural residence.<sup>88</sup> None has considered disparities per se. Eliminating disparities requires a clear definition to allow measurement and monitoring of progress toward that goal and to understand their causes. Here we examine the definition of health dis-

parities and empirical findings on disparities associated with race/ethnicity and socioeconomic status. We then consider methodological challenges and solutions to understanding the causes of health disparities.

## DEFINITION OF HEALTH DISPARITIES

The literature lacks a consensually agreed on definition of health disparities. *Healthy People 2010* referenced “differences that occur by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation.”<sup>100,p.14</sup> Carter-Pokras & Baquet<sup>17</sup> identified 11 different definitions of health disparities. Some were inclusive, some limited disparities to those associated with race and ethnicity, and still others defined it only in terms of disparities in health care.

The various definitions imply and sometimes explicitly suggest the relevant comparison group for establishing a disparity. Definitions of racial/ethnic disparities suggest that a group’s health status be compared with the majority, the population average, or the healthiest group. Thus, one might compare African American mortality rates to national rates, to European Americans who are the majority group in the United States, or to Asian Americans, who have in aggregate the lowest mortality rates. Depending on the relative size and the relative health of the majority group and the healthiest group, one could reach different conclusions about the extent of a disparity.

With the exception of Murray and colleagues,<sup>78</sup> who examined a range of socio-demographic characteristics of groups with markedly different life expectancies, most approaches to disparities start with bases of social disadvantage, which result in differences that are unjust and avoidable.<sup>13,15</sup> *Healthy People 2010* distinguishes between a health difference, which results from inherent biological differences (e.g., only women are subject to ovarian cancer and men to prostate cancer), and a disparity, which results from social factors. What constitutes a difference versus a disparity may sometimes be unclear, however. In the example of ovarian and prostate cancer, differential investment in research on treatment and prevention of one disease versus the other could reflect the relative advantage of males versus females. If men have more power to allocate resources for research and health care and differentially provide funding for prostate versus ovarian cancer, the resulting death rates from these diseases could constitute a disparity. This suggests that simple com-



parisons of mortality rates are not an adequate basis on which to evaluate health disparities. One also needs to know the biological potential of each group. Although women outlive men (a fact pointed to by some who advocate for more attention to men's health as a disparity issue), the gap between current life expectancy and life expectancy under optimal conditions could potentially be greater for women than for men.

Differences in biological potential have been raised in relation to racial/ethnic health disparities, suggesting these are differences rather than disparities. However, the contribution of unavoidable biological differences to overall disparities by race/ethnicity is relatively small. A few diseases (e.g., sickle cell anemia) have a clear primary genetic basis, but these are of a limited number and there is little evidence for a differential genetic basis for the many diseases for which disparities occur.<sup>75</sup> For example, African Americans have higher rates of hypertension than do European Americans, which some attribute to differential genetic vulnerability. However, prevalence of hypertension among blacks is lower in Caribbean countries than in the United States and lower still among blacks in Africa. Hypertension rates in Africa are, in fact, equivalent to or lower than rates among whites in the United States.<sup>26</sup> These findings suggest that higher rates of hypertension for blacks in the United States compared with other racial/ethnic groups are more likely to be due to social factors than to underlying biological vulnerability.

Health disparities result from both biological differences and social disparities. We focus on the latter not just because the effect is greater, but also because they are avoidable and inherently unjust.

## EMPIRICAL WORK ON DISPARITIES

The bulk of research has focused either on disparities due to race/ethnicity or disparities due to social class and socioeconomic resources. Disparities by gender and geography have also been investigated, often in terms of how these factors modify racial/ethnic or social class disparities. Most research has not invoked an explicit model of disparities and studies are shaped and constrained by the availability of relevant data. For example, British studies emphasize social class as determined by occupational status using the Registrar General's measure of social class. This measure has been in use for many years and provides a fine-grained hierarchical ordering of occupations. Nothing comparable exists in the United States,

where national data are more likely to include race/ethnicity than measures of socioeconomic position. For example, it was not until 1989 that education was added to the U.S. standard certificate of death, and health records of large population groups such as those enrolled in Kaiser Permanente often include only race/ethnicity but not socioeconomic status (SES). Thus, it has been easier to characterize racial/ethnic disparities in the United States than those linked to social class. The data show that African Americans have higher mortality and poorer health status than does any other group, as do Native Americans. Overall mortality rates are surprisingly higher for non-Hispanic whites than for Hispanics or Asian Americans; relative mortality varies for specific causes of death.<sup>3,94</sup> For 1999-2001, male life expectancy for U.S.-born blacks and whites was 67.5 and 74.8 years, respectively. Life expectancy for U.S.-born Hispanic males (75.2 years) was greater than for non-Hispanic whites and was greater still for U.S.-born Asian/Pacific Islanders (78.9 years). The same pattern is shown for women. For both men and women, the health advantage of Hispanic and Asians compared to U.S.-born whites is even greater for recent immigrants in these groups (see Foreign-Born Populations box).

## Intersection of SES and Race/Ethnicity

Some definitions limit disparities to those associated with race/ethnicity. This focus has been fostered both by relative availability of data as described above and by social equity concerns based on current and historical racism and discrimination. Such a limitation can be problematic, however, given marked differences in the distribution of racial/ethnic groups across levels of education, income, occupation, and wealth.<sup>29,56</sup> Examining race/ethnicity without simultaneously considering socioeconomic position can attribute too much influence to race/ethnicity per se, and may inadvertently foster an emphasis on biological differences. This point is forcefully made by Isaacs & Schroeder,<sup>52</sup> who argue that social class is the "ignored determinant" of health in the United States.

Researchers are increasingly looking at how SES and race/ethnicity function jointly and independently to affect health. Socioeconomic measures often account for a large part of racial/ethnic differences, although independent effects of race/ethnicity on health outcomes also exist, depending on what outcome is examined. Adequate control for SES across racial/ethnic groups may be difficult to achieve.<sup>54</sup>

### FOREIGN-BORN POPULATIONS

Place of birth is a critical and frequently ignored component of socioeconomic and racial/ethnic disparities. To the extent that first-generation immigrants make up a substantial proportion of a given group's population in the United States, immigrants' health advantage may contribute to differences between groups. For most health outcomes (notable exceptions are stomach cancer and liver disease), foreign-born individuals in the United States have lower rates of disease than do their native-born peers. Controlling for demographic and socioeconomic factors, immigrant men and women 25 years of age and older had mortality rates 18% and 13% lower, respectively, than did nonimmigrants.<sup>95</sup> Immigrants as a group lived 3.4 years longer on average than did those born in the United States in 1999–2001, an increase over a gap of 2.3 years two decades earlier.<sup>94</sup> The gap was largest for native-born vs. immigrant blacks and Hispanics.

Most analyses of health disparities do not include birth place and do not account for the generally lower rates of disease among foreign-born individuals.<sup>79</sup> U.S. Hispanics as a group have lower all-cause mortality rates than do non-Hispanic blacks or non-Hispanic whites; a difference that becomes even greater after controlling for household income. The relatively lower rates of all-cause mortality among Hispanics as compared with non-Hispanics in the United States have been well documented, and a large literature investigating the substantive and potentially artifactual reasons for this has emerged (although no clear consensus has been reached yet).<sup>79</sup> Asian Americans, too, show favorable health profiles, with the lowest prevalence of a number of diseases and the lowest all-cause mortality rate of any major racial/ethnic group, and the role of migration processes in these disparities is also an area of active research.

SES indicators may have different meanings for different groups. For example, at the same income level, the amount of wealth and debt differ substantially by racial/ethnic group; Hispanics and African Americans have lower wealth than non-Hispanic whites and Asians at a given income level.<sup>14,24</sup> Similarly, at any given educational level, these groups have lower incomes than do whites.<sup>14</sup> Although some studies “control” for SES by adjusting for an indicator such as education or income, this adjustment is insufficient given evidence for independent effects of the different domains of SES. Controlling for a single measure is unlikely to capture the effects of social class per se, and residual confounding may be erroneously interpreted as racial/ethnic differences.<sup>14,54</sup>

### Descriptive Findings

A descriptive understanding of socioeconomic and racial/ethnic disparities is important for (a) understanding both long- and short-term trends in health disparities, (b) informing causal investigations of health disparities, (c) targeting resources for prevention and treatments to reduce disparities in specific diseases, and (d) increasing public awareness of the existence and characteristics of health disparities. Below we briefly consider descriptive data regarding mortality disparities, cause-specific disparities, geographic variation in disparities, and time trends in these disparities.

**All-cause mortality.** The first U.S. study with a sample size sufficient to allow the examination of socioeconomic disparities within race/ethnicity based on individual-level data was done by Kitigawa & Hauser,<sup>58</sup> although data constraints limited comparisons to whites and nonwhites. Using data from the 1960 matched records of persons age 25 and over, they documented that compared with whites, age-adjusted all-cause mortality rates for nonwhites were 34% higher for females and 20% higher for males, correcting for net census undercount. They also examined mortality by education, occupation, income, and geographical location. For white men and women ages 25–64 mortality was respectively 64% and 105% higher for the least compared with the most educated. For nonwhite men and women the comparable difference in mortality by education was 31% and 70%, respectively. Pappas et al.<sup>81</sup> revisited this work, with data from 1986, showing a relatively sharper decrease in mortality over this time period for higher-income and more-educated individuals, thus creating greater relative disparities by income and education overall and within racial/ethnic groups over time. This and other work also highlights the importance of disparities based on social class for both women and men, despite some earlier work that suggested smaller social class disparities among women.<sup>72</sup>

In addition to dichotomizing race into white and nonwhite, earlier U.S. research generally dichotomized income into below versus above the poverty line. Publication of the Whitehall study inspired researchers to see if SES formed a graded association with health in the United States, as it did in England. Multiple studies have now demonstrated SES gradients by income and by education for a range of health outcomes including mortality, incidence of cardiovascular disease, arthritis, diabetes, asthma, cervical cancer, depression, and disability in children, adolescents, and both younger and older adults.<sup>4,22,43,76</sup> Although these associations occur

across the distribution, they are generally stronger at the lowest levels of income and education.<sup>8,33,91</sup>

**Cause-specific mortality.** Studies uniformly find higher all-cause mortality for blacks than for whites under age 65, but within this overall trend there is heterogeneity by cause of death. For example, data from the National Longitudinal Mortality Study (NLMS) of 1.3 million persons<sup>89</sup> reveal a racial/ethnic difference for mortality from many but not all diseases. Black and white men under age 65 had approximately the same standardized mortality ratio (SMR) for ischemic heart disease, whereas (in order of magnitude of difference) black men had substantially higher SMRs than did whites for homicide, hypertensive heart disease, esophageal cancer, and pulmonary circulation but had relatively lower SMRs for aortic aneurysm, suicide, leukemia, and chronic obstructive pulmonary disease (COPD). Black women had substantially higher rates of homicide, hypertensive heart disease, diseases of pulmonary circulation, nephritis, and stomach cancer than did white women, with comparatively lower levels of suicide, COPD, and leukemia.

Howard et al.<sup>51</sup> also used data from the NLMS and found that SES accounted for different amounts of black-white mortality differences depending on the cause of death. For men, SES accounted for 30%-55% of the black-white mortality differences for accidents, lung cancer, stomach cancer, stroke, and homicide, but less than 17% of the differences for prostate cancer, pulmonary disease, and hypertension. For women, SES accounted for 37%-67% of differences for accidents, ischemic heart disease, diabetes, and homicide, but less than 17% for hypertension, infections, and stomach cancers. However, only income and education were used as SES controls, which could underestimate the contribution of SES to black-white mortality differences. Kington & Smith<sup>57</sup> found that with more complete demographic controls including wealth, racial/ethnic differences in functional limitation in health of older individuals were eliminated, although differences remain for other chronic diseases.

Wong et al.<sup>106</sup> also studied the contribution of education and race/ethnicity to different causes of death. Whereas many causes of death contributed in a similar way to both racial/ethnic and educational disparities in mortality (e.g., cardiovascular disease, liver disease), other causes were responsible for greater educational differentials (e.g., cancer, lung disease) or greater black-white differences (e.g., hypertension, lung disease, homicide). The data from these studies show that although the direction of disparities is fairly consistent, the extent of socioeco-

nom and racial/ethnic disparities and their interactions differ substantially by cause.

**Geographic variation.** Although marked differences in mortality rates across the United States have been noted, the extent to which socioeconomic factors and race/ethnicity explain these variations had not been adequately studied. However, data from within metropolitan areas reveal a geographic variation that can be substantially explained by considering these factors. These data also suggest that differences in local socioeconomic conditions have a greater impact on African American mortality than white mortality, resulting in an interaction between socioeconomic factors and race/ethnicity with respect to geography.<sup>23,98</sup> This is consistent with data from the NLMS<sup>89</sup> showing that the locations with the lowest mortality rates for whites and for blacks were at an equivalent level, even as overall rates were higher for blacks. These studies of geographic differences show the importance of area context for disparities and note that relationships among race/ethnicity, class, and health are not fixed, even within the United States during a given time period.

**Changes in disparities over time.** The magnitude of disparities in mortality by race/ethnicity and by SES have changed over time, providing further evidence that these disparities are changeable and preventable. Preston & Ilo<sup>86</sup> confirmed Pappas's finding of increasing education gradients for all-cause mortality for men since 1960 but also found that education differentials in mortality declined for women 25-64 and remained stationary for women 65-74. Ward et al.<sup>104</sup> examined disparities in cancer mortality by race/ethnicity 1975-2000. Prior to 1980 investigators saw no black/white disparities in breast cancer mortality among women and saw slightly higher rates of colorectal cancer mortality among white as compared with black men. But this changed, and by 2000, black women had higher breast cancer mortality than did white women and black men had higher colorectal cancer mortality than did white men. The black-white gap in overall life expectancy decreased from 1975 to 1984, increased from 1984 to 1992-1994, then decreased again through 2004.<sup>48</sup> Most of these changes stemmed from relative improvements for blacks in specific causes of death (e.g., relatively greater decreases from 1994 to 2004 in homicide and unintentional injuries for both sexes and for HIV for men and heart disease for women).

Disparities in risk factors for disease have also changed over time. For example, Zhang & Wang<sup>108</sup> examined obesity rates among U.S. women 20-60 years old from 1971 to 2000 using data from the National Health and Nutrition Examination Survey

(NHANES). Owing to rapid increases in obesity prevalence among all educational groups, education disparities actually decreased, although all groups were worse off. These results highlight the importance of overall population trends for assessing progress in reducing health disparities.

**Changes in disparities over the life course.** The extent and nature of health disparities changes over the life course. Substantial disparities begin at birth; babies born to mothers who are poor, have lower education, and/or are African American are smaller at birth and are more likely to die within the first year of life. Disparities are smallest during childhood, adolescence, and early adulthood and greatest in middle age, becoming weaker again in older populations.<sup>5</sup> The primary explanation for diminished disparities in older populations is that the least healthy individuals are no longer in the population, and mortality will eventually be experienced by all regardless of socioeconomic status and race/ethnicity. Although selection over time can produce artifactual population patterns,<sup>102</sup> the proportion of the narrowing of disparities explained by selection is unclear. There may also be etiologic reasons, including the provision of safety net supports such as Social Security and Medicare, which are available to older adults and may reduce and/or buffer the effects of disadvantage.

**Variation by measure of SES.** Occupation, income, and education have different associations with health outcomes.<sup>58,89</sup> As currently operationalized, education and income are generally more strongly associated with health in U.S. data than are measures of occupation other than employed versus nonemployed. However, weaker associations with occupation may be due to the use of standard U.S. occupational measures.<sup>14</sup> Using a classification based on the new U.K. national statistics social class measure—which categorizes individuals as managers/professionals, intermediate, small employers and self employed, lower supervisory and technology, and semiroutine/routine or not in labor force—Barbeau et al.<sup>9</sup> found occupational associations with current smoking status as strong as those with education or income. Variations by SES measure used speak to the frequent recommendation of using discrete measures of SES such as education or income rather than a composite.<sup>32</sup> In addition to empirical reasons, use of specific SES measures clarifies intervention possibilities.

## UNDERSTANDING THE NATURE AND CAUSES OF DISPARITIES

General patterns of disparities over the late twentieth century in the United States are similar: Those

with fewer resources have worse health outcomes for a number of different causes. But variations by health outcome, place, time, and age point to the fact that these associations are not fixed or immutable, and that this heterogeneity should be used to better understand the causes of disparities. Kunitz<sup>63</sup> places links between distribution of resources and health within particular historical, socioeconomic, and cultural contexts. Given these variations, a deeper understanding of off-diagonals may be informative about the nature of disparities. This analysis would include diseases that do not show disparities or are more prevalent in more advantaged groups (e.g., black-white differences in kidney function and socioeconomic differences in breast cancer). It would also include those who do not show expected patterns such as immigrants, low-SES individuals in good health, and high-SES individuals in poor health. Finally, international comparisons of socioeconomic disparities highlight the importance of national contexts for understanding the nature of health disparities.

### Establishing Causality

There are clearly documented associations of SES and health outcomes, but the causal link is still debated. Some questions are methodological, dealing with alternative explanations for the associations. Others are concerned with the nature of the mechanisms by which these upstream factors influence health. SES is unlikely to affect health directly (e.g., having more dollars in one's pocket is not health protective). Rather, it shapes life conditions that, in turn, influence health. In this section we first consider the methodological challenges to understanding causes of health disparities and then consider potential mechanisms by which SES may affect morbidity and mortality.

**Methodological challenges—alternative explanations.** When asserting that a measure of SES leads to sub-optimal health and premature mortality, researchers must address possible alternative explanations for the associations that are found.<sup>42,45</sup> The first possibility is that associations result from random chance; this possibility can be assessed by specifying confidence intervals around the effect estimate or p-values. Second, associations may be due to conditioning on an effect of the exposure and outcome occurring either through the selection of the sample (i.e., selection bias) or through use of inappropriate control variables.<sup>42,50</sup> Avoiding this possibility requires using a causal understanding of the process that created the data to inform sample selection and an appropriate choice of control covariates.

A third challenge is that the presumed health outcome may cause the exposure (reverse causation or health selection bias).<sup>58,96</sup> For example, illness may prompt individuals to decrease work hours, change to less demanding and lucrative jobs, or leave the labor force entirely. Using data from the Health and Retirement Study of individuals over the age of 50, Smith<sup>96</sup> found that wealth decreased by \$17,000, and earnings by \$2,600 per year with the onset of major disease. Collecting measures of income that predate the health assessment through longitudinal designs, data linkage or retrospective earnings recall can decrease reverse causation potential between income and health. Using a lagged approach with longitudinal data, McDonough et al.<sup>71</sup> found little difference in predicting all-cause mortality between a one-year lag and a five-year lag, thus questioning the importance of reverse causation for explaining the mortality associations. Using another approach to account for health selection, Benzeval & Judge<sup>10</sup> controlled for initial health status in addition to using measures of income prior to disease onset, and the associations between income and health outcomes remained.

There is less reason for concern about reverse causation between education and health. Generally the temporal lag between education exposure and adult health outcomes argues against adult health impacting education.<sup>58</sup> However, childhood illnesses and low birth weight may contribute to lower educational attainment.<sup>18,25</sup> These factors are themselves a function of SES. Haas<sup>46</sup> demonstrated that disadvantaged social background led to sub-optimal health in childhood, which made a subsequent impact on adult social class.

Overall, although health can affect SES, SES significantly affects health. The extent of reciprocal influence for specific outcomes is generally not understood. Longitudinal data with health, education, income, labor force participation, and wealth measures over time can more accurately model the process of social stratification and the extent to which causation and selection impact specific health outcomes at different points in the life course.

A fourth concern is whether associations result from the joint association of SES and health with a common underlying cause such as genetic factors, time preferences/delayed gratification,<sup>39</sup> or cognitive ability.<sup>44</sup> As with reverse causation, these confounders may themselves reflect SES. Early family environments affected by parents' education and income may shape all three of these potential confounders, including the extent to which genetic potential is realized through epigenetic processes. As evidence of the importance of SES and child envi-

ronments for adult health increases, rather than viewing these factors as undermining evidence for the importance of socioeconomic factors on health, they should be viewed as part of the dynamic process between SES and health over the life course.

**Data structure and methods.** In addition to collecting appropriate data to control for potential alternative explanations in regression models, several types of data structures can also facilitate better determination of causal relationships and help rule out alternative explanations for observed correlations. True experiments are rare because individuals cannot easily be randomly assigned to levels of education, income, or occupation. However, experimental trials of interventions that modify some aspect of SES or factors associated with it are informative. Researchers have also taken advantage of natural experiments to assess the effects of economic or policy changes that affect an individual's SES but are not due to his or her own characteristics or behaviors. These reduce confounding and allow for a more easily conceptualized counterfactual.<sup>45</sup> Relevant examples include using German reunification to estimate the effects of income on health,<sup>38</sup> changes in the Earned Income Tax Credit to estimate the effects of household income on children's test scores,<sup>28</sup> enactment of schooling laws to estimate the effects of education on mortality,<sup>66</sup> and changes in legislation affecting Social Security benefits to estimate the effects of income on mortality in an older population.<sup>97</sup> With the exception of the Social Security payments, these studies confirm the effects from observational studies of socioeconomic factors to health.

Data with repeated measures on individuals over time also provide some strength for making causal claims.<sup>87</sup> Repeated measures allow observation of the temporal sequence of cause and effect. Birth cohorts provide particularly rich data for modeling early life confounders and exposures of interest. Three British studies of representative samples of children born in 1946, 1958, and 1970 have provided critical data about the causes of health disparities and have shown the impact on adult health and behaviors of early life exposures and socioeconomic position at different points in life.<sup>84,103</sup> Using data from the 1958 cohort, Power et al.<sup>85</sup> found a number of causes of health inequalities at age 33, including class at birth, socioemotional adjustment, educational level, and psychosocial job strain. In the absence of a birth cohort, follow-up of members of completed studies of children and adolescents can provide some of the same advantages.<sup>41</sup>

**Analytic approaches.** In addition to the design approaches described above, new analytic methods are facilitating a better understanding of the causes

of health disparities. Five methods that may be particularly useful are propensity score matching, instrumental variables, time-series analysis, causal structural equation modeling, and marginal structural models.

Propensity scores provide an analytical method for balancing factors associated with being in either of the analytical comparison groups of interest in a particular study (e.g., high versus low education). If assumptions are met it allows for unbiased causal estimates of the exposure under study.<sup>27,90</sup> They have been used to identify the effects of gun violence exposure on subsequent violent activity,<sup>11</sup> neighborhood characteristics on dropping out of high school,<sup>47</sup> and neighborhood socioeconomic environment on cardiovascular mortality.<sup>30</sup> This approach is based on the same principle as adjusting for confounders in a regression model and similarly requires all confounders be measured. However, they facilitate assessment of whether overlap of confounding variables actually allows one to compare the analytic groups of interest appropriately, and they also provide power to control for a larger number of confounding covariates.

Instrumental variables (IV) offer advantages when analyzing data from natural experiments or similar designs. The crucial assumption is the availability of a variable (the instrument) that does not directly affect the outcome but is only associated with the predictor of interest, and where the exposure (instrument) is not itself influenced by known confounders.<sup>7</sup> This approach has been used to show causal effects of income on health outcomes<sup>34</sup> and to demonstrate the effect of years of schooling on all-cause mortality.<sup>66</sup>

Time-series analyses are particularly helpful for evaluating policy changes or other population exposures by analyzing the variation in health outcomes over time, while allowing investigators to identify and remove temporal autocorrelation and also account for lag effects between exposure and outcome. Particularly useful are data from multiple locations with different temporal ordering of the exposure to remove more general temporal trends. This approach has been used to demonstrate the effects of unemployment on alcohol abuse<sup>19</sup> and on very low birth weight<sup>20</sup> and to examine trends in black-white disparities over time.<sup>65</sup>

Structural equation models have been used extensively in the social sciences to understand complex relations between variables and to test relationships among hypothesized causes, mediators, and outcomes. Despite controversy, work over the past two decades by Pearl and others<sup>82,83</sup> has clarified the con-

ditions under which the models may be used to represent cause. A significant innovation for gaining this understanding is the use of directed acyclic graphs (DAGs), a graphical language for describing causal relations. These form a framework for representing assumptions about elements of the causal pathways from social exposures to outcomes and information about possible confounders. Explicit delineation of the proposed causal structures through DAGs allows other researchers to evaluate the assumptions made and to build on the proposed structures. These models facilitate identification of valid empirical tests of proposed causal models.<sup>31</sup> This is helpful in testing proposed mediators between social class and health.<sup>55</sup> A causal structural modeling approach using DAGs is also mathematically equivalent to marginal structural models,<sup>82</sup> which allow (when assumptions are met) a determination of the overall causal effect of an exposure within a framework based on treating unobserved counterfactuals as missing data.<sup>101</sup>

Chandola et al.<sup>21</sup> used this approach with data from the 1958 British Birth Cohort to examine the relative contributions of six different pathways connecting education and health. The structural model included factors at age 7 (cognitive ability, father's social class), age 16 (adolescent health), age 23 (education), age 33 (adult social class, sense of control, healthy behaviors), and age 42 (adult health). It showed no direct effect of education on adult health but showed significant effects through adult social class, control, and behaviors, with differences by gender in the strength of pathways.<sup>21</sup> A similar approach was taken by Mulatu & Schooler<sup>77</sup> in examining the relative strength of behavioral and psychosocial pathways between SES and health.

### Pathways and Mechanisms

Much recent research has attempted to explicate the pathways and the mechanisms by which SES influences health. Although few studies have explicitly tested these through structural equation models, the studies provide many candidates. Physical and social environments, including a person's home, school, work, neighborhood, and community, vary by SES and affect the likelihood of individuals' exposure to both health-damaging conditions and health-protecting resources. Health-damaging exposures within these pathways include early life conditions, inadequate nutrition, poor housing, exposure to lead and other toxins, inadequate healthcare, unsafe working conditions, uncontrollable stressors, social exclusion, and discrimination.<sup>5,6,105</sup>

Some of the exposures listed above have direct effects on health, whereas others may influence psychological dispositions and behaviors that have health consequences. A vast literature demonstrates the contribution of psychosocial and behavioral factors to morbidity and mortality. These factors include cognition and emotion (e.g., depression, hopelessness, hostility, and lack of control) and behavior (e.g., use of cigarettes, alcohol, and other substances). Gallo & Matthews<sup>40</sup> observed that substantial evidence links negative emotions with many health outcomes and links SES with negative emotions, but few studies have analyzed these pathways together. For example, hostility and hopelessness are strongly predicted by childhood socioeconomic position<sup>49</sup> and are linked, in turn, to poorer health.<sup>12,37,40</sup> However, the extent to which the links between childhood SES and adult health are accounted for by hostility and hopelessness has not been determined.

The few studies that have considered mediation by psychosocial factors provide supportive findings, but these have used regression rather than structural equation models. For example, Marmot et al.<sup>67</sup> examined the role of sense of control over one's work in explaining health disparities within the Whitehall sample. The higher the grade of the civil servants, the more control they experienced in relation to their work conditions. Consistent with hypothesized mediation, the association of occupational grade with health was substantially reduced when adjusted for sense of control.

A common element in many of the proposed mechanisms linking SES to health is differential exposure to stress. Disadvantaged environments expose individuals to greater uncertainty, conflict, and threats for which there are often inadequate resources to respond effectively. These experiences cumulate to create chronic stress. Until recently, stress research focused primarily on acute stress, which is more easily modeled in the lab, and was based on a model of homeostasis. The development of the model of "allostatic load" (AL)<sup>73</sup> provided a major conceptual advancement to understand health disparities. This model posits that the body does not simply reestablish homeostasis after experiencing a perturbation associated with a stressor. Rather, with repeated exposures, set points for various systems involved in the stress response, including the endocrine, metabolic, cardiovascular, and immune systems, may shift. Although the body may be in balance, the systems become burdened and dysregulated by the costs of the repeated adaptation cycles.<sup>74</sup> Precise ways to assess AL are still being developed,

but early findings suggest that it is a useful approach. Seeman et al.<sup>92,93</sup> assessed AL in terms of 10 dysregulation indicators in a sample of older adults who had no major diseases at baseline. AL scores were higher in those with less education and predicted subsequent decline in physical and cognitive functioning, new cardiovascular disease, and seven-year mortality. Using data from the Normative Aging Study, Kubzansky et al.<sup>62</sup> also found higher AL among those with less education and further found evidence that the effect was partially mediated by hostility.

Although the effects of chronic stress cumulate over time, the biological manifestations may be seen relatively early in life. Evans<sup>35</sup> found that children from disadvantaged environments had higher AL than did children from more affluent backgrounds, and one indicator of AL was found in structural equation models to mediate the impact of poorer housing conditions on illness-related school absences.<sup>53</sup>

These examples are a few of thousands of studies on a variety of potential mechanisms and pathways. Most of these have not been linked specifically with health disparities but provide detailed information on different levels of cause that could result in disparities. Data sets with adequate measures of socioeconomic factors and race/ethnicity, potential psychosocial and biological mechanisms, and health outcomes are necessary to best understand pathways. These then can be analyzed using techniques such as causal structural models that allow modeling and testing of multiple direct and indirect pathways to health outcomes that are the bases of disparities.

## CONCLUSION

Substantial health disparities exist in the United States by social class and race/ethnicity. It would, of course, be preferable to eliminate disparities by addressing the root causes, changing the inequitable resource distribution that now accompanies SES and race/ethnicity as well as other bases of disparity. For effective policy development and interventions, we need persuasive data on the causes of disparities. This entails moving beyond associations to establish causal relationships. In addition, understanding the pathways and mechanisms that mediate these effects provides more information about the multiple causes of health disparities and offers possible interventions to alleviate their occurrence.

## SUMMARY POINTS

1. In the United States, health disparities associated with race/ethnicity and socioeconomic status (SES) are widespread.
2. Variation in disparities by cause of death, geographic region, and time suggest that disparities are modifiable and avoidable.
3. Differences in distribution across levels of SES for blacks and whites may account for many racial/ethnic health disparities; socioeconomic causes of racial/ethnic disparities cannot be ruled out without comprehensive measures of SES.
4. A variety of strategies can be used to provide stronger evidence of causal influences of SES on health, including use of data structures, such as natural experiments, and analytic methods, such as structural equation modeling.
5. Identifying pathways and mechanisms by which SES and race/ethnicity affect health provides better evidence of causation and more options for intervention to eliminate disparities.
6. Evidence shows multiple pathways from SES and race/ethnicity to health; one pathway is through differential exposure to chronic stress and its resulting biological toll.

## Disclosure Statement

The authors are not aware of any biases that might be perceived as affecting the objectivity of this review.

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## 3

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## Changing Patterns of Mortality among American Indians

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*Source:* Kunitz SJ. Ethics in public health research: changing patterns of mortality among American Indians. *Am J Public Health* 2008;98:404-11. Reprinted with permission of the American Public Health Association.

Mortality rates for American Indians (including Alaska Natives) declined for much of the 20th century, but data published by the Indian Health Service indicate that since the mid-1980s, age-adjusted deaths for this population have increased both in absolute terms and compared with rates for the White American population.

This increase appears to be primarily because of the direct and indirect effects of type 2 diabetes. Despite increasing appropriations for the Special Diabetes Program for Indians, per capita expenditures for Indian health, including third party reimbursements, remain substantially lower than those for other Americans and, when adjusted for inflation, have been essentially unchanged since the early 1990s. I argue that inadequate funding for health services has contributed significantly to the increased death rate. (*Am J Public Health*. 2008;98:404-411. doi:10. 2105/AJPH.2007.114538)

Over the past century, mortality among American Indians (including Alaska Natives) declined roughly in parallel with that of the rest of the U.S. population, although rates continue to be higher than for white

Americans. The decline, which persisted for most of the 20th century despite the vicissitudes of federal policies, practices, and appropriations, is an example of the epidemiological transition from a regime characterized by infectious diseases to one characterized by noninfectious, chronic diseases.<sup>1</sup> It is generally assumed that in advanced economies this progression is more or less inevitable; infectious diseases recede and are replaced in relative importance by noninfectious diseases, but total mortality continues to fall.

The collapse of the Soviet Union and the catastrophic reversal of declining mortality in its former republics and elsewhere in Eastern Europe show that such progress is not inevitable.<sup>2</sup> There are other cases of reversal or, at the very least, stagnation of declining mortality in advanced economies. For example, the life expectancy of Aboriginal Australians has been largely stagnant for several decades,<sup>3</sup> and recent changes in the mortality rates of American Indians indicate something similar.

I use published data to examine recent changes in age-adjusted mortality of American Indians in general and of Navajos in particular. Navajo data are included for several reasons: (1) the Navajos, as the largest tribe living on a reservation in the United States, have an important impact on overall rates; (2) during the period under consideration, Navajo health services were provided by the Indian Health Service (IHS) and not by tribally managed programs; and (3) historical data on Navajo health services and

mortality are more readily available than for other, smaller American Indian populations.

Causes of death are classified as either amenable or not amenable to interventions by the health care system. This classification is usually traced to the work of David Rutstein et al. in the mid-1970s.<sup>4</sup> As Holland has said,

Here medical care is defined in its broadest sense, that is prevention, cure and care, including the application of all relevant medical knowledge, the services of all medical and allied personnel, the resources of governmental, voluntary, and social agencies, and the cooperation of the individual himself. An excessive number of such unnecessary events serves as a warning signal of possible shortcomings in the health care system, and should be investigated further.<sup>5(p1)</sup>

Avoidable deaths, which are described in more detail in the following section, may thus arise for a variety of reasons, including unusual genetic and epidemiological characteristics of particular populations, inadequate funding, inaccessible services or populations, incompetent staff, uninformed populations, and noncompliant patients. Although all of these factors may be contributory, the fact that some populations have higher rates than others is an indication that adequate health services responsive to the unique needs of particular populations may not be available.<sup>6</sup>

I briefly consider two other issues. The first has to do with the impact of devolution of responsibility for services to American Indian tribal governments or other entities. Self determination in American Indian affairs has been federal policy since 1974, and some attempts have been made to examine the impact, if any, on health of changes in management.<sup>7</sup> The second has to do with a question debated in public health since the early years of the 20th century: the degree to which programs should be vertical or horizontal. The former refers to programs aimed at the eradication or control of a particular disease. The latter refers to programs covering a broad range of services.<sup>8-11</sup>

## METHODS

Data for my analyses of time trends in American Indian mortality from the early 1970s through the 1990s came from IHS publications.<sup>12,13</sup> They included only deaths in the IHS service area, which comprises primarily states in the Midwest and West.

Data for the Navajo Area of the IHS came from two different sources. Historical data, taken from previously published material,<sup>14</sup> were for the population living on the Navajo Reservation. Data from the late 1990s and early 2000s, published by the Navajo Area IHS,<sup>15</sup> refer to the service area, which comprises both the reservation and adjacent nonreservation lands where many Navajos live.

Because death data were available only for New Mexico and Arizona, only the populations of the service areas in those two states were used as the denominator for calculating rates. The number of Navajos living in the Utah portion of the service area is very small, and their exclusion did not significantly influence the results. The classifications of cause of death on the Navajo Reservation in 1972 through 1978 and in the Navajo service area in 1998 through 2002 were from different revisions of the *International Classification of Diseases*<sup>16,17</sup> and thus may not be precisely comparable. Nonetheless, the codings of several of the most important causes of death, most notably diabetes, are similar enough to be useful for broad comparative purposes.

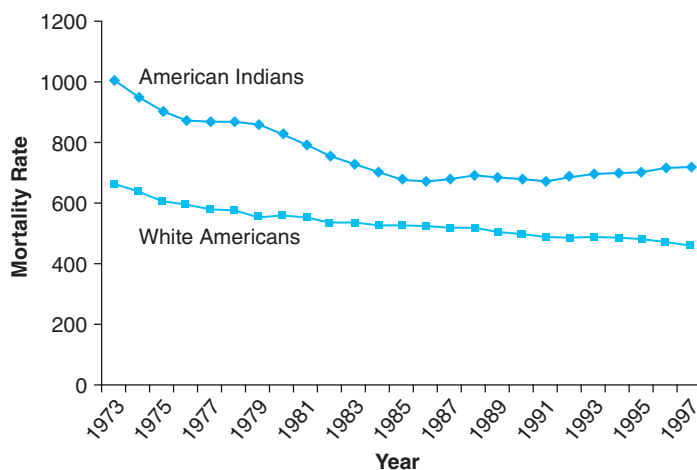
Causes of death amenable and not amenable to interventions by the health care system are the same as have been used elsewhere.<sup>18</sup> The IHS does not publish death rates for all causes, nor are age data published for most causes. (The causes that are available for the analysis of deaths caused by conditions amenable to health care interventions can be found as a supplement to the online version of this article at <http://www.ajph.org>.<sup>13,19,20</sup>)

## RESULTS

### Mortality Trends among American Indians

Figure 1 displays all-cause, age-adjusted (to the 1940 U.S. population) death rates from 1973 through 1997 for American Indian and white Americans. Although rates for the former are higher than for the latter, they both declined during the first half of the period. Starting in the mid-1980s, however, they diverged as the rate for American Indians began to increase. At its nadir in 1986, the death rate for American Indians was 669.1 per 100,000. Over the next 10 years, it rose to 715.2 per 100,000, an increase of about 46 per 100,000. Over the same period, the rate for white Americans declined from 520.1 per 100,000 to 456.5 per 100,000 and has continued to decline in subsequent years.

Figures 2 and 3 display age-adjusted death rates from 1973 through 1997 for causes amenable and



**FIGURE 1** Mortality rates, per 100 000, by race, from all causes of mortality: American Indians<sup>a</sup> and white Americans, 1973–1997.

not amenable to intervention by the health care system. Among the former causes, deaths from diabetes among American Indians increased most significantly, whereas deaths from heart disease and cerebrovascular diseases declined, but at lower rates than among white Americans—so much so, indeed, that over the 24-year period the relative positions of the death rates of American Indians and of white Americans reversed.

The increased all-cause death rate of American Indians starting in the mid-1980s seems to have been partly the result of a stagnation in rates of decline of alcohol-related and cirrhosis deaths, and of deaths from pneumonia or influenza and tuberculosis, and an increase in rates of death from lung cancer and diabetes, the latter almost doubling from 29 per 100,000 to 53 per 100,000. Although there are insufficient data to explain the entire increase in all-cause mortality, it is clear that slightly more than half the increase (24 of 46 per 100,000) was directly caused by diabetes. Over the same 10-year period, deaths from lung cancer increased from 24 per 100,000 to 34 per 100,000, accounting for about 20% of the increase.

### The Navajo Area

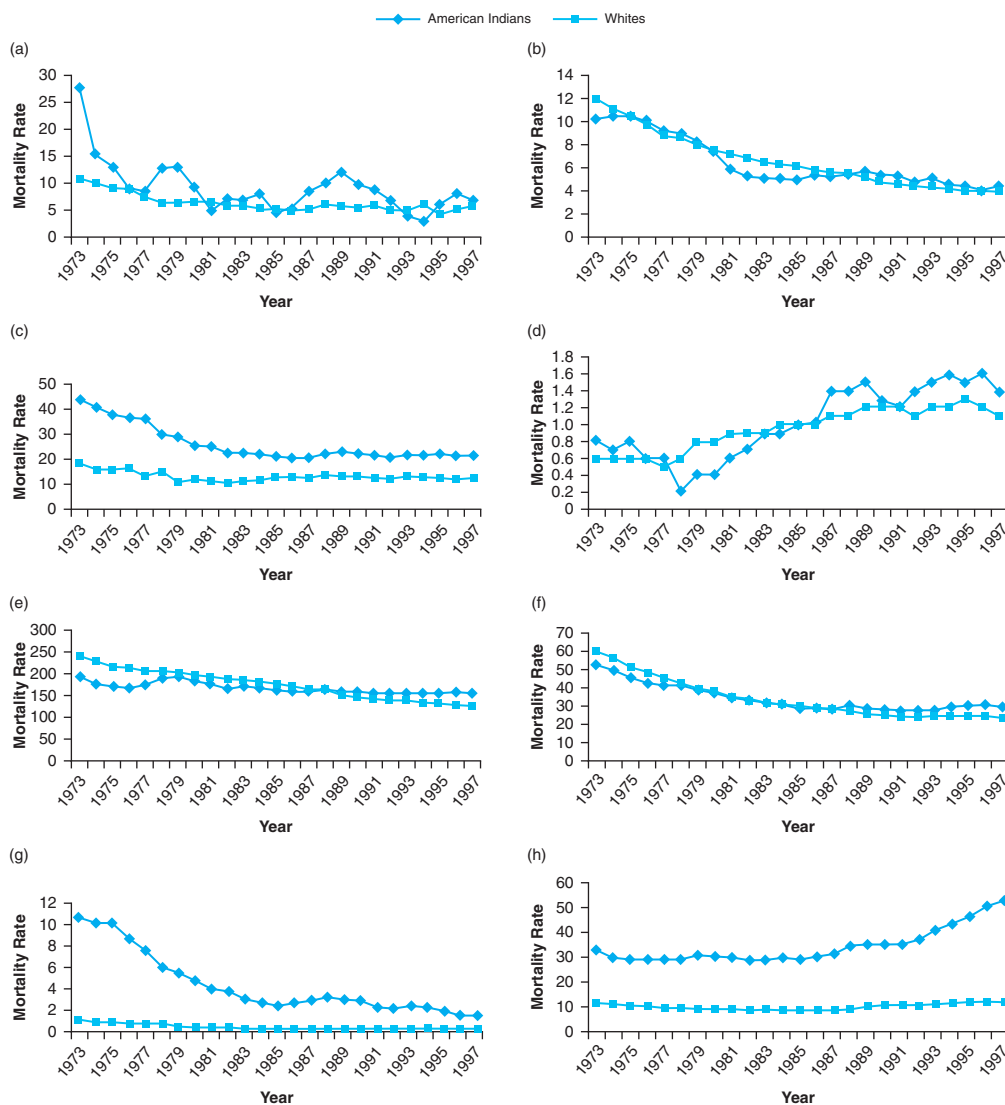
Per capita allocations of the IHS budget among service areas vary greatly; in 1993 they ranged from \$575 per enumerated American Indian in the Oklahoma area to \$1906 in Alaska.<sup>6</sup> Among rural populations, the Navajo Area, which is located in Arizona, New Mexico, and a small strip of southern Utah, had one of the lowest allocations, whether

measured per user of services (\$608) or per enumerated American Indian in the service area (\$717). At the time to which the following data apply, all services were provided directly by the IHS and not by the Navajo Nation, although two of the eight service units have since come under the control of community boards.

Table 1 (not included) shows that the number of hospital beds per 1000 population has declined steadily over the past 70 years, as have occupancy rates, hospitalizations per 1000 population, and average length of stay.

Table 2 (not included) shows that since the 1970s, nursing staff has become more professionalized as registered nurses have replaced licensed practical nurses, but overall, the ratio of nursing staff to population has remained the same. Likewise, the ratio of public health nurses to population, considered separately, has remained almost unchanged. By contrast, the number of physicians per 10,000 population has almost doubled over the same period, from 8.3 to 15.5; this figure, although substantially less than the nationwide figure of 23.2 per 10,000,<sup>15(p41)</sup> is similar to those for Arizona (17.2 per 10,000) and New Mexico (16.8 per 10,000).<sup>21,22</sup> At the same time, median household income increased substantially (Table 3). Although the rate of increase in income was greater on the Navajo Reservation than in the surrounding states in the 1990s, absolute income was still substantially less.

From the early 1970s to the years 1996 through 1998, life expectancy increased from 58.8 years for men and 71.8 years for women to 68 and 76.5 years for men and women, respectively.<sup>12,26</sup>



Note: Mortality rates are age-adjusted to the 1940 US population. These causes of mortality are amenable to intervention by the healthcare system.

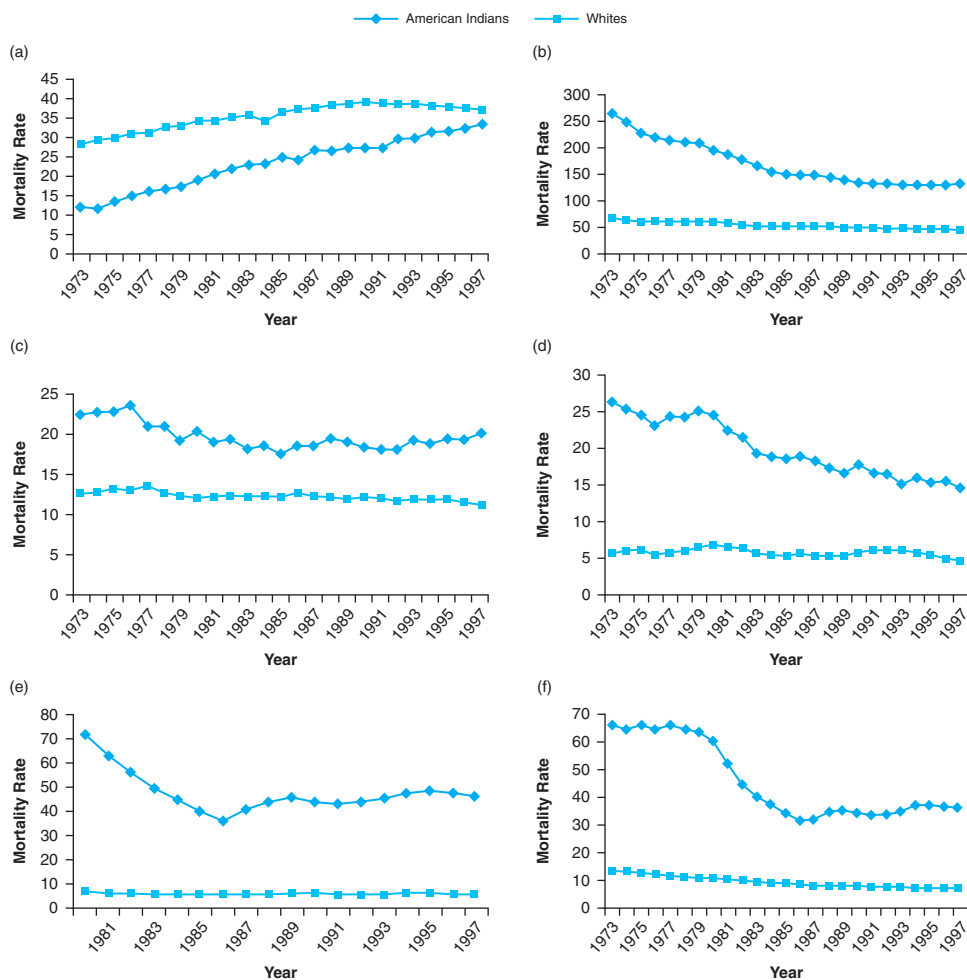
<sup>a</sup>Includes Alaska Natives.

**FIGURE 2** Mortality rates, per 100 000, by race, from maternal causes (a), neonatal causes (b), influenza and pneumonia (c), asthma (d), heart disease (e), cerebrovascular disease (f), tuberculosis (g), and diabetes (h): American Indians<sup>a</sup> and white Americans, 1973–1997.

This reflects the continuing epidemiological transition experienced by the Navajos over the past century. Infectious diseases have declined and noninfectious conditions have increased, some in relative importance and others in absolute importance. Table 4 displays crude average annual death rates for the periods 1972 to 1978 and 1998 to 2002 for several different broadly defined causes. Among conditions considered not amenable to health service interventions, accidents declined, suicide increased, and homicide and cirrhosis remained essentially unchanged. Among conditions

amenable to intervention by the health care system, tuberculosis, neonatal mortality, pneumonia, and influenza all declined, whereas death rates from heart and cerebrovascular disease and from diabetes increased.

The epidemic of non-insulin-dependent diabetes among American Indians was relatively late in affecting the Navajos. Although prevalence seems to have begun to increase in the 1960s, it began to receive increasing attention only in the 1980s.<sup>27,28</sup> It is widely agreed to be the consequence of increasing obesity and changing dietary and activity



Note: Mortality are rates age-adjusted to the 1940 US population. These causes of mortality are not amenable to intervention by the health care system. Data for earlier years of alcohol-related causes were not available.

<sup>a</sup>Includes Alaska Natives.

**FIGURE 3** Mortality rates, per 100,000, by race, from lung cancer (a), unintentional injuries (b), suicide (c), homicide (d), alcohol-related causes (e), and chronic liver disease and cirrhosis (f): American Indians<sup>a</sup> and white Americans, 1973–1997.

**Table 1**

**Health Facilities and Utilization of Services in the Navajo Area of the Indian Health Service: 1933–2003**

Year	Hospital Beds, No.	Occupancy Rate,%	Average Beds/ 1000 Population	Hospitalizations/ Length of Stay,d	1000 Population	Outpatient Visits/Person
1933	352	111.0 <sup>a</sup>	...	...	...	...
1940	564	50.0	11.3	20.5	182.8	1.1
1960	...	...	...	...	...	1.5–1.7
1966	547	83.6	5.2–5.9	8.9	158–181	...
1977/78	557	60.0	3.9	5.4	152.0	4.5
2003	351	43.3	1.5	3.3	72.5	5.1

<sup>a</sup>The 111% occupancy rate indicates overcrowding.

Note: Ellipses indicate that no data are available.

Source: Data are from Kunitz<sup>14</sup> and the Navajo Area Indian Health Service.<sup>15</sup>



**Table 2** Medical Personnel at Health Facilities in the Navajo Area of the Indian Health Service: 1977 and 2003

Year	Registered Nurses	Public Health Nurses	Licensed Practical Nurses	Total Nursing Staff	Physicians
1977	16.9	2.81	10.8	30.5	8.3
2003	26.9	2.4	2.2	31.5	15.5

Note: Personnel are per 100,000 population.

Source: Data are from Kunitz<sup>14</sup> and the Navajo Area Indian Health Service.<sup>15</sup>

**Table 3** Median Family Income in Current and 1999 Dollars on the Navajo Reservations and in Neighboring States: 1969–1999

Year	Navajo Reservation		New Mexico <sup>a</sup>		Arizona <sup>a</sup>	
	Current \$	1999 \$	Current\$	1999 \$	Current \$	1999 \$
1969	3,084 <sup>b</sup>	12,083	7,096	27,803	8,199	32,125
1979	...	...	14,654	31,350	16,448	35,118
1989	10,958 <sup>c</sup>	14,296	24,087	31,425	27,540	35,930
1999	20,005 <sup>d</sup>	20,005	34,133	34,133	40,558	40,558

Note: Ellipses indicate that no data are available.

<sup>a</sup>Data are from the U.S. Census Bureau.<sup>23</sup>

<sup>b</sup>Figure is from the U.S. Census Bureau.<sup>24</sup>

<sup>c</sup>Figure is from Rodgers.<sup>25</sup>

<sup>d</sup>Figure is from Navajo Area Indian Health Service.<sup>15</sup>

**Table 4** Crude Average Annual Death Rates in the Navajo Area of the Indian Health Service: 1972–1978 and 1998–2002

Cause	Death Rate per 100,000	
	1972–1978	1998–2002
Accidents (motor vehicle accidents)	213.0 (106.0)	99.5 – 106.9 (63.6–68.4)
Homicide	15.6	13.0 – 13.9
Suicide	8.3	16.4 – 17.6
Neoplasms	38.0	63.6 – 68.4
Circulatory/ cardiovascular disease	72.8	108.0–116.1
Tuberculosis	6.8	1.7 – 1.8
Diabetes	10.1 <sup>a</sup>	28.6 – 30.7
Infant mortality	17.6	6.2
Neonatal	8.7	4.1
Postneonatal	8.9	2.1
Cirrhosis/ chronic liver disease	18.1	18.4 – 19.8
Pneumonia/influenza	56.1 <sup>a</sup>	24.6 – 26.4
Estimated population	132,156	200,000 – 215,000

<sup>a</sup>Figures are from an unpublished report by the Navajo Area Indian Health Service, Office of Program Planning and Evaluation, Window Rock, Ariz, June, 1998.

Source: Data are from Kunitz<sup>14</sup> and the Navajo Area Indian Health Service.<sup>15</sup>

patterns,<sup>29-31</sup> and it carries with it increased risk of morbidity and of mortality from cardiovascular diseases.<sup>28,32-34</sup> Moreover, hypertension is also strongly associated with diabetes, but only about 50% of hypertensive individuals found in a com-

munity survey had been told by a physician that they had hypertension.<sup>35</sup> About one third of diabetics in the same survey were unaware that they had diabetes, suggesting that both screening and prevention were not widely available.<sup>36</sup>

## DISCUSSION

Although all the data I present have been published previously, most appeared in government publications, both federal and tribal, and are not widely known to the public health community. The data are important both in their own right, reflecting as they do a deterioration in the health of a small but significant population of Americans, and because they may foreshadow changes experienced more broadly in the United States, especially among the poor. Income has increased among American Indians in general<sup>37</sup> and Navajos in particular, but mortality caused by several chronic conditions amenable to intervention by the health care system has increased. This is similar to what has occurred in many poor countries, in which the emergence of ischemic heart disease and other chronic conditions is now recognized as a widespread phenomenon.<sup>38</sup> Such changes are usually attributed to changes in diet and exercise patterns attendant on the shift to relatively sedentary occupations and the increased availability of processed foods.

### Avoidable Deaths

Important as changes in lifestyle are, however, health services have an important role to play in the prevention and treatment of these conditions. Health care systems in general, including the IHS, have been effective in reducing death rates from many conditions. Typically, these conditions have been primarily infectious diseases; however, the incidence and severity of stroke, hypertension,<sup>39,40</sup> and ischemic heart disease<sup>41</sup> in non-American Indian populations have also been affected by treatment. In addition, diabetics, who are at substantially increased risk of death from cardiovascular disease, also benefit from tight control of their diabetes, treatment of hypertension, and use of anti-coagulants such as aspirin.<sup>42,43</sup>

Reduction of diabetes-related deaths is not simply a matter of primary prevention and changes in lifestyle. Compared with whites, American Indians have higher rates of self-reported obesity, smoking, diabetes, and heart disease; spend less time in leisure-time physical activity; and have worse self-assessed health, even after adjustment for sociodemographic variables.<sup>44-46</sup> Primordial prevention (the prevention of the underlying causes of risk factors) and primary prevention (the reduction of risk factors) are thus crucially important in this population. High death rates, however, cannot simply be accepted as the result of too many fast food restaurants and irrespon-

sible or uninformed lifestyle choices and personal behavior. As the concept of amenable conditions suggests,

an excessive number of such unnecessary events serves as a warning signal of shortcomings in the health care system, and should be investigated further.<sup>5(p1)</sup>

Indeed, this has been recognized by both the IHS and the U.S. Congress. A Special Diabetes Program for Indians was mandated in 1997 that has provided substantial and increasing funds for the prevention and treatment of diabetes: \$30 million per year in 1997 through 2000, \$100 million per year in 2001 through 2003, and \$150 million per year since 2004.<sup>13,47</sup> The results have been encouraging: among treated diabetics, such measures as average diastolic blood pressure and cholesterol, hemoglobin A1c, and triglyceride levels all declined from 1995 through 2001, although mortality rates from diabetes have not declined.<sup>48,49</sup>

Although these declines are statistically significant, their clinical and epidemiological significance is uncertain because (1) these measures are still high, and cardiovascular disease risk factors are more important for diabetics than for nondiabetics, and (2) some of the results may be shifted downward by lead-time bias, whereby more-thorough screening leads to more cases being detected at an earlier and milder stage. Nonetheless, the recognition of the magnitude of the problem presented by diabetes, and the attempt to intervene, is of great significance.

Unfortunately, even taking these new funds and third-party payments into account, per capita expenditures for American Indian health remain well below those for other citizens, and in constant dollars they have remained essentially flat for well over a decade.<sup>13</sup> At the beginning and end of the 1990s, per capita expenditures for the IHS service population were about \$1662; according to recent unpublished analyses by the IHS, they remain about the same (Cliff Wiggins, IHS, oral communication, February 27, 2007).

### Horizontal and Vertical Programs

In this context, specially targeted funds such as the Special Diabetes Program for Indians are no doubt important and welcome, but they raise a question that has been debated in public health for much of the 20th century: the appropriateness of vertical as opposed to horizontal programs. The justification for vertically organized programs aimed at specific diseases has been that once diseases are eradicated or

at least controlled, they no longer need to be a concern for the health care system.<sup>8</sup> Smallpox is the best example. By contrast, horizontal programs are justified because they provide the full range of services and indeed may be necessary if vertical programs are to have a lasting effect.<sup>9</sup>

One may also speculate that vertical programs are less likely to successfully stand alone when they are targeted at chronic diseases rather than, for instance, vaccine-preventable diseases. Chronic diseases may require a full range of services. Diabetes, for example, causes complications that may require dialysis and surgical intervention, which are best provided by a comprehensive health care system. With an essentially unchanging budget, however, provision of a broad range of services—that is, horizontal programs—becomes increasingly difficult to sustain, because expenditures fail to keep pace with population growth and inflation of health care costs.

The shift from inpatient to outpatient care on the Navajo Reservation over the past 70 years is largely the result of the change from infectious to noninfectious diseases, as well as changes in medical practice. The evidence cited here, however, also indicates that a high proportion of people with hypertension and diabetes are unaware of their diagnoses, suggesting that services are not reaching many who could benefit from them. This may be, at least in part, a consequence of having too few health care providers to meet the needs of the population, which in turn results from the very low per capita health expenditures for the Navajo population. Another possible cause, however, is that even in areas in which there are about the same number of providers as for nearby non-American Indian populations, the ability to provide needed services has been compromised by deficient budgets.

### Self-Determination

Budgetary issues also confound attempts to assess the impact of self-determination on health. The years since the early 1970s have been a time of major change in American Indian health programs. It was in 1974 that President Nixon declared that, henceforth, tribal self-determination rather than termination (i.e., ending recognition of tribes as domestic sovereign nations) would be his administration's policy.<sup>50</sup> That has been government policy ever since, and an increasing number of tribal governments have assumed responsibility for providing services to their populations. One appraisal of the policy in 1998 claimed that IHS data showed a continuing improvement in the health status of American Indians over the previ-

ous 20 years,<sup>7(p227)</sup> which at the very least demonstrated that self-determination was not having deleterious consequences. More-recent data presented here, however, indicate that there have been changes for the worse in health status. Indeed, unpublished data from the IHS indicate that American Indian mortality has continued to stagnate since 1997 (Edna Paisano and Joanne Papallardo, IHS, written and oral communication, February 16, 2007).

The reversal of mortality decline cannot, however, be attributed to the management of health services by tribal entities. First, regional analyses published elsewhere show no clear association—either positive or negative—between rates of death from causes amenable to intervention and the proportion of services managed by tribes, beyond what could be better explained by median household income.<sup>6,51</sup> Second, over the years for which Navajo Area data were analyzed, during which deaths from diabetes and cardiovascular diseases increased, none of the health programs were managed by the Navajo Nation.

Although the temporal association between a stagnant budget and stagnant mortality rates do not prove causation, the relationship is not likely to be entirely fortuitous. The continuing low level of funding for American Indian health programs, regardless of whether services are provided directly by the IHS or by tribal entities, seems likely to have had an impact on health status. Health care for American Indians is not treated as an entitlement in the federal budget<sup>49</sup> but is a discretionary item subject to changing administration and congressional priorities.<sup>52</sup> This is why spending has been flat, and it is reasonable to suggest that it is also why American Indians have not benefited from health services as they should.

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## Towards a Common Definition of Global Health

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Global health is fashionable. It provokes a great deal of media, student, and faculty interest, has driven the establishment or restructuring of several academic programmes, is supported by governments as a crucial component of foreign policy,<sup>1</sup> and has become a major philanthropic target. Global health is derived from public health and international health, which, in turn, evolved from hygiene and tropical medicine. However, although frequently referenced, global health is rarely defined. When it is, the definition varies greatly and is often little more than a rephrasing of a common definition of public health or a politically correct updating of international health. Therefore, how should global health be defined?

Global health can be thought of as a notion (the current state of global health), an objective (a world of healthy people, a condition of global health), or a mix of scholarship, research, and practice (with many questions, issues, skills, and competencies). The need for a commonly used and accepted definition extends beyond semantics. Without an established definition, a shorthand term such as global health might obscure important differences in philosophy, strategies, and priorities for action between physicians, researchers, funders, the media, and the general public. Perhaps

most importantly, if we do not clearly define what we mean by global health, we cannot possibly reach agreement about what we are trying to achieve, the approaches we must take, the skills that are needed, and the ways that we should use resources. In this Viewpoint, we present the reasoning behind the definition of global health, as agreed by a panel of multidisciplinary and international colleagues.

Public health in the modern sense emerged in the mid-19th century in several countries (England, continental Europe, and the United States) as part of both social reform movements and the growth of biological and medical knowledge (especially causation and management of infectious disease).<sup>2</sup> Farr, Chadwick, Virchow, Koch, Pasteur, and Shattuck helped to establish the discipline on the basis of four factors: (1) decision making based on data and evidence (vital statistics, surveillance and outbreak investigations, laboratory science); (2) a focus on populations rather than individuals; (3) a goal of social justice and equity; and (4) an emphasis on prevention rather than curative care. All these elements are embedded in most definitions of public health.

The definition of public health that has perhaps best stood the test of time is that suggested by Winslow almost 90 years ago:<sup>3</sup>

“Public health is the science and art of preventing disease, prolonging life and promoting physical health and efficacy through organized community efforts for the sanitation of the environment, the control of communicable infec-

tions, the education of the individual in personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and the development of social machinery which will ensure every individual in the community a standard of living adequate for the maintenance of health; so organizing these benefits in such a fashion as to enable every citizen to realize his birthright and longevity.”

The U.S. Institute of Medicine (IOM), in its 1988 *Future of public health* report,<sup>4</sup> described public health in terms of its mission, substance, and organisational framework, which, in turn, address prevention, a community approach, health as a public good, and the contributions of various partners. The IOM report defined the mission of public health as “fulfilling society’s interest in assuring conditions in which people can be healthy”.<sup>4</sup> In the *Dictionary of Epidemiology* (2001), Last<sup>5</sup> defined public health as “one of the efforts to protect, promote and restore the people’s health. It is the combination of sciences, skills and beliefs that is directed to the maintenance and improvement of the health of all the people through collective or social actions”.

International health has a more straightforward history. For decades, it was the term used for health work abroad, with a geographic focus on developing countries and often with a content of infectious and tropical diseases, water and sanitation, malnutrition, and maternal and child health.<sup>6</sup> Many academic departments and organisations still use this term, but include a broader range of subjects such as chronic diseases, injuries, and health systems. The Global Health Education Consortium defines international health as a subspecialty that “relates more to health practices, policies and systems . . . and stresses more the differences between countries than their commonalities”.<sup>7</sup> Other research groups define international health as limited exclusively to the diseases of the developing world.<sup>8</sup> But many find international health a perfectly usable term and have adapted it to coincide with the philosophy and content of today’s globalised health practice.<sup>7,8</sup> International health is defined by Merson, Black, and Mills<sup>9</sup> as “the application of the principles of public health to problems and challenges that affect low and middle-income countries and to the complex array of global and local forces that influence them”.

Global health has areas of overlap with the more established disciplines of public health and international health (Table). All three entities share the following characteristics: priority on a population-based

and preventive focus; concentration on poorer, vulnerable, and underserved populations; multidisciplinary and interdisciplinary approaches; emphasis on health as a public good and the importance of systems and structures; and the participation of several stakeholders. In view of these commonalities, we are left with key questions that need to be resolved to arrive at a useful and distinctive definition for global health. We address some of these questions here.

What is global? Must a health crisis cross national borders to be deemed a global health issue? We should not restrict global health to health-related issues that literally cross international borders. Rather, in this context, global refers to any health issue that concerns many countries or is affected by transnational determinants, such as climate change or urbanisation, or solutions, such as polio eradication. Epidemic infectious diseases such as dengue, influenza A (H5N1), and HIV infection are clearly global. But global health should also address tobacco control, micronutrient deficiencies, obesity, injury prevention, migrant-worker health, and migration of health workers. The global in global health refers to the scope of problems, not their location. Thus—like public health but unlike international health—global health can focus on domestic health disparities as well as cross-border issues. Global health also incorporates the training and distribution of the health-care workforce in a manner that goes beyond the capacity-building interest of public health.

Is global health mainly directed to infectious disease and maternal and child health issues or does it also address issues such as chronic diseases, injuries, mental health, and the environment? Infectious diseases and maternal and child health have dominated international health and continue to receive the most attention and interest in global health. However, global health has to embrace the full breadth of important health threats. This broad set of priorities might mean accepting that, for many countries, the epidemiological transition is a continuing process. Simultaneous effort needs to be expended on undernutrition and overnutrition, HIV/AIDS and tobacco, malaria and mental health, tuberculosis and deaths due to motor vehicle accidents. Infectious agents are communicable and so are parts of the western lifestyle (i.e., dietary changes, lack of physical activity, reliance on automobile transport, smoking, stress, urbanisation). Burden of illness should be used as a criterion for global-health priority setting.

How does global health relate to globalisation? The spread of health risks and diseases across the world, often linked with trade or attempted conquest, is not new to public health or international

Table	Comparison of global, international, and public health		
	Global health	International health	Public health
Geographical reach	Focuses on issues that directly or indirectly affect health but that can transcend national boundaries	Focuses on health issues of countries other than one's own, especially those of low-income and middle-income	Focuses on issues that affect the health of the population of a particular community or country
Level of cooperation	Development and implementation of solutions often requires global cooperation	Development and implementation of solutions usually requires binational cooperation	Development and implementation of solutions does not usually require global cooperation
Individuals or populations	Embraces both prevention in populations and clinical care of individuals	Embraces both prevention in populations and clinical care of individuals	Mainly focused on prevention programmes for populations
Access to health	Health equity among nations and for all people is a major objective	Seeks to help people of other nations	Health equity within a nation or community is a major objective
Range of disciplines	Highly interdisciplinary and multidisciplinary within and beyond health sciences	Embraces a few disciplines but has not emphasised multidisciplinary	Encourages multidisciplinary approaches, particularly within health sciences and with social sciences

health. Plague spread across Europe and Asia in the middle ages; quarantine was developed in 14th-century Venice; smallpox and measles were introduced to the New World by European invaders in the 16th century; the same explorers took tobacco from the Americas to Europe and beyond, leading to premature disease and death; and opium was sold to China in the 18th and 19th centuries as a product of trade and subjugation by imperial western powers. Nevertheless, the rapid increase in speed of travel and communication, as well as the economic interdependency of all nations, has led to a new level and speed of global interconnectedness or globalisation, which is a force in shaping the health of populations around the world.

Must global health operate only within a context of a goal of social/economic equity? The quest for equity is a fundamental philosophical value for public health. The promotion of social and economic equity, and reduction of health disparities, has been a key theme in domestic public health, international health, and global health. Up to now, most health initiatives in countries without sufficient resources to deal with their own health problems have come about through the assistance of wealthier countries, organisations, and foundations. Although this assistance is understandable, it does not help us to distinguish global health as a specialty of study and practice.

Global health has come to encompass more complex transactions between societies. Such societies recognise that the developed world does not have a monopoly on good ideas and search across cultures for better approaches to the prevention and treatment of common diseases, healthy environments, and

more efficient food production and distribution. The preference for use of the term global health where international health might previously have been used runs parallel to a shift in philosophy and attitude that emphasises the mutuality of real partnership, a pooling of experience and knowledge, and a two-way flow between developed and developing countries. Global health thus uses the resources, knowledge, and experience of diverse societies to address health challenges throughout the world.

What is the interdisciplinary scope of global health? Professionals from many diverse disciplines wish to contribute to improving global health. Although global health places greater priority on prevention, it also embraces curative, rehabilitative, and other aspects of clinical medicine and the study of basic sciences. But these latter areas are less central to the core elements of public health than are its population-based and preventive orientations. Clearly, many disciplines, such as the social and behavioural sciences, law, economics, history, engineering, biomedical and environmental sciences, and public policy can make great contributions to global health. Thus, global health encompasses prevention, treatment, and care; it is truly an interdisciplinary sphere.

A steady evolution of philosophy, attitude, and practice has led to the increased use of the term global health. Thus, on the basis of this analysis, we offer the following definition: global health is an area for study, research, and practice that places a priority on improving health and achieving equity in health for all people worldwide. Global health emphasises transnational health issues, determinants, and solutions; in-



volves many disciplines within and beyond the health sciences and promotes interdisciplinary collaboration; and is a synthesis of population-based prevention with individual-level clinical care.

We call for the adoption of a common definition of global health. We will all be best served (and best serve the health of others around the world) if we share a common definition of the specialty in which we work and to which we encourage others to lend their efforts.

### Contributors

All authors contributed to the writing and editing of the manuscript. The Consortium of Universities for Global Health (CUGH) Executive Board developed the definition and reviewed and edited the manuscript.

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### Conflicts of interest

We declare that we have no conflicts of interest.

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