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Behavior change and reducing health disparities ☆

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ABSTRACT

The mission of the National Institutes of Health,"... is science in pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability". A wide range of factors contribute to longer life and to less illness. Although estimates vary, most analyses suggest that only about 10% of the variation in health outcome is attributable to medical care. Further, medical care is most effective in addressing and preventing infectious disease and acute illnesses. Recent large randomized clinical trials often fail to demonstrate that medical care lengthens life expectancy. International comparisons suggest that life expectancy in the United States is increasing, but the rate of increase is falling behind that of other wealthy countries. Strategies for improving health outcomes include better dissemination and implementation of proven evidence-based interventions. Further, reduction of services that use resources but do not offer health benefits must be considered. The final section of this paper reviews evidence relevant to factors outside the health care system that may enhance life expectancy and reduce illness and the disability. The relationship between educational attainment and life expectancy is used as a case example. The potential of behavioral and social interventions for increasing life expectancy may be orders of magnitude greater than traditional medial interventions. However, considerably more research is necessary in order to provide persuasive evidence for the benefits of these programs.

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The mission statement for the National Institutes of Health is, "Science in pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability". The mission statement has two clauses. The first refers to the basic science mission of developing fundamental knowledge. It explicitly includes the study of the behavior of living systems. The second clause is the applied aspect of the mission. It requires the use of knowledge to make life longer and to improve life quality. This commentary focuses on the latter component of the mission. Behavioral and social sciences play a crucial role in understanding variation in life expectancy and in contributing to the science of improving health-related quality of life (Kaplan, 2000, 2002; Kaplan and Coons, 1992; Kaplan et al., 1976, 2011).

I come to this task as an investigator interested in outcomes research. Outcomes researchers have a different perspective than other biomedical investigators. We look at outcomes with reference to only two central measures: length of life, and quality of life (Kaplan, 2000, 2002). The central argument is that the goal of medicine and public health is to lengthening human life and/or improve quality of life during the years that people survive. As simple as this perspective seems, it often leads to different conclusions in comparison to the traditional biomedical model. The outcomes perspective argues that physiological measures are only important if they relate to life duration or life quality. Blood pressure, for example, is a meaningful biological measure because it is highly predictive of early death or disability associated with myocardial infarction or stroke. Other measures less clearly relate to the twin objectives of improved life quality or lengthened life expectancy. Catecholamine variations in response to acute stress, for example, are less clearly related to the objectives that outcomes researchers focus on.

Another different perspective arising from outcomes research is the focus on all cause mortality as opposed to disease specific mortality (Kaplan, 1990). A variety of large clinical trials in medicine have demonstrated reductions in one cause of death but compensatory increases in other causes of death (Kaplan, 1994). Trials on screening mammography, for example, frequently show that breast cancer screening leads to a reduction in breast cancer mortality. Yet the same trials often fail to show that breast cancer screening increases life expectancy (Gotzsche and Jorgensen, 2013; Navarro and Kaplan, 1996). Although breast cancer deaths might be reduced, other causes of death are increased during the study period (Kaplan and Porzsolt, 2008). Another example of this problem is illustrated by the Physicians Health Trial. In this study, approximately 22,000 physicians were randomly assigned to take 325 mg of aspirin every other day or to a placebo. When the data were first analyzed significantly fewer physicians in the aspirin condition had died of myocardial infarction. However, considering all

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causes of cardiovascular death, the number of physicians who had died was exactly the same in the aspirin and placebo groups (see Fig. 1). All of these deaths were within the study period and all were considered premature deaths. Aspirin changed what was recorded on the death certificate, but did not extend the life expectancy (Kaplan, 1989). Considering the specific cause of death (MI) would lead to the conclusion that aspirin was highly effective. From the outcomes perspective, aspirin had no effect. From patient's perspective, we would argue that people and families are most concerned about the person's vital status and less concerned about a specific cause of death.

US life expectancy in international perspective

International studies of life expectancy have gained particular attention in the last few years. These studies tend to show that the life expectancy advantage experienced by American citizens has been on the decline. One study from the National Research Council considered current life expectancy for 50-year-old women between the years 1955 and 2010 (Crimmins et al., 2011). Current life expectancy is the number of years of life on average remaining once a milestone age has been reached. So, current life expectancy for 50-year-old women is the median number of years of life remaining following the 50th birthday. In 1955 Americans were about 12th in the world on this indicator. By 2006, they had slipped to about the 26th position, just below Korea and Malta. In a life expectancy comparison of 10 wealthy countries, American women were 3rd out of 10 in 1955, but they slipped to 9th out 10 in 2006. Among the many countries with more rapid increases in life expectancy were Japan, France, and Spain. Japan, for example, was considerably below the United States in 1955 and now is many years ahead.

In response to these findings, the NIH Office of Behavioral and Social Sciences Research (OBSSR) along with the National Institute on Aging sponsored another study that compared life expectancy in the United States against 17 peer countries (Woolf and Laudan, 2013). These comparison countries were primarily in Western Europe, but also included Australia, Japan, and Canada. The results of the comparison are quite disturbing. Among the 17 countries, the United States had the second highest mortality rate from noncommunicable diseases. Mortality from communicable diseases was fourth from the bottom for the United States. The United States had the third highest AIDS rates, exceeded only by Brazil and South Africa, and the AIDS incidence in the United States was 122 per million which is about nine times the average of countries in the Organization or Economic Cooperation and Development (OECD).

We have known for some time that US life expectancy at birth is not keeping pace with other developed countries. Although our life expectancies are increasing, the rate of increase is much slower than it has been in other economic competitors. This trend has been developing over the course of several decades. Perhaps the most surprising finding in the study concerned years of life lost prior to age 50. The committee considered international differences in the probability of celebrating a 50th birthday. On this indicator, the United States was last among the 17 comparison countries for both men and women. United States losses in life expectancy prior to age 50 are about double the rate observed in Sweden. Perhaps most disturbing is that this problem profoundly affects women. Fig. 2 shows the trend in years of life lost in 21 high income countries between the years 1980 and 2006. For men, the US started at the low end of the distribution and worked its way to the bottom. For women, the US started near the bottom and now has gone off the scale in relation to the comparison countries.

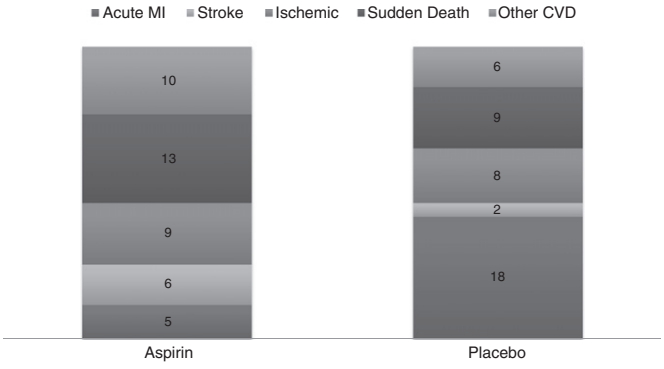

Fig. 1. Total Mortality in the Aspirin Component of the Physician's Health Study. Overall the number of physicians who died was identical in the Aspirin and the Placebo conditions (adapted from Kaplan, NEJM 1989).

What about advances in medical care?

It is often argued that the United States has the very best medical care in the world. So, we would expect advances in medical therapies to address many of our health care problems. The difficulty is that recent clinical trials often do not support the level of benefit that the public expects from medical therapies. In fact, most recent large randomized clinical trials have failed to show the expected benefit of medical and surgical therapies (Gordon et al., 2013). One example is the ACCORD trial of aggressive therapy for the treatment of non-insulin-dependent diabetes mellitus (Action to Control Cardiovascular Risk in Diabetes Study et al., 2008). Patients were randomly assigned to standard therapy or to an intensive therapy. The intensive therapy significantly changed biological outcomes in the expected direction. Specifically, those assigned to intensive therapy had significantly lower levels of glycosylated hemoglobin. From a traditional perspective the treatment achieved its goal. However, long-term follow-up considered total mortality and deaths from cardiovascular disease. Considering all cause mortality, those assigned to intensive therapy had a higher probability of death in comparison to the standard therapy condition.

The ACCORD trial is just one of many randomized clinical trials with similar results. Trials considering intensive therapy for anemia suggest that agents that increase red blood cells do their job and bring hemoglobin counts toward normal. Yet patients in these conditions have a higher probability of renal failure requiring dialysis and other adverse outcomes (Drueke et al., 2006). Large studies on hormone replacement therapy usually show that estrogen levels are raised toward normal premenopausal levels. Yet the consequences for patients, from an outcomes research perspective, are usually poorer rather than better (Chlebowski et al., 2003).

Another example is provided by the Prostate Cancer Prevention Trial (PCPT) (Thompson et al., 2013). In this long-term study, 18,882 men with prostate cancer were randomly assigned to the drug Finasteride or to a placebo. All of the men were followed prospectively for at least 15 years using the National Death Index. Initially it appeared that the drug had worked successfully. Just over 10% of the men who took Finasteride showed evidence of prostate cancer in comparison to nearly 15% in the placebo group. However, the number of deaths in the two groups was virtually identical: 78.0% versus 78.2%. The drug reduced the number of men with clinical prostate cancer but the purpose for taking the drug in the first place was to reduce deaths. The analysis suggested that there was little progress toward that ultimate goal. Further, those men who took the active drug had significantly higher rates of complicating side effects.

A final example considers treatment for coronary heart disease. The causes of heart disease are well understood. There is an initial injury to the endothelial wall of the coronary artery. Plaque builds up and narrows the artery and this results in restricted blood flow. Often, a fibrous cap on the lesion ruptures and a blood clot forms, totally occluding the flow of blood to the heart muscle. One solution for this problem is to perform angioplasty by placing a stent in the narrowed artery. The stent holds the artery open so that nourishing blood flow can continue.