

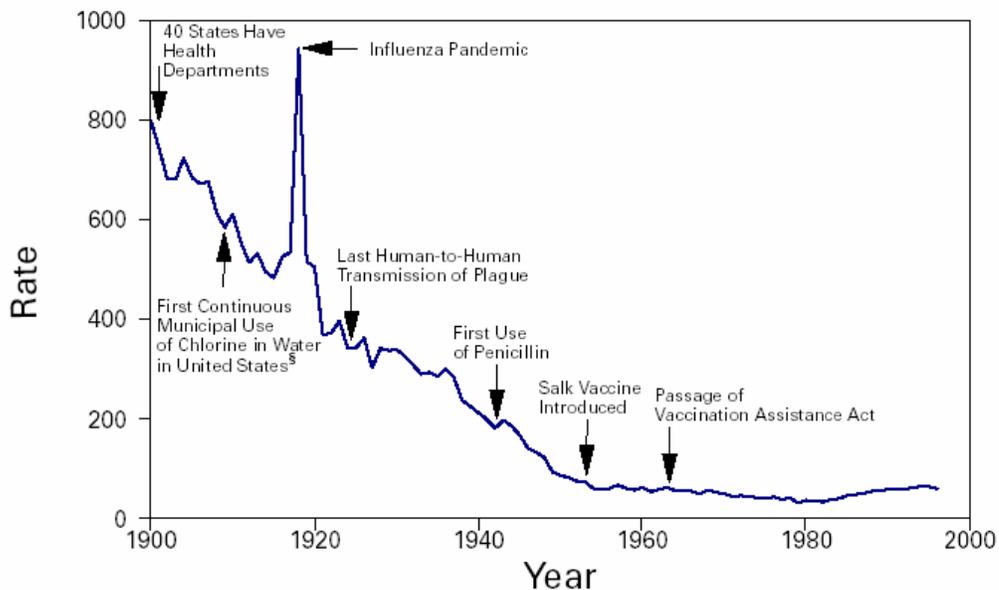
Comments on Costa and Kahn by Barbara L. Wolfe

This very interesting paper contributes to the debate on the causes of the rapid decline in mortality and improvements in health in the early twentieth century and is part of a larger debate on the role of medical interventions in health. In my comments below I discuss two primary topics: the use of mortality as an outcome measure and a fuller model of factors likely to lead to improvements in health, noting throughout topics for future research. I also address a few vexing points in the paper.

Is mortality a reliable outcome measure?

I begin by putting this paper in an epidemiological context (Figure 1) that highlights the importance of the period it addresses.

FIGURE 1. Crude death rate* for infectious diseases — United States, 1900–1996†



*Per 100,000 population per year.

†Adapted from Armstrong GL, Conn LA, Pinner RW. Trends in infectious disease mortality in the United States during the 20th century. *JAMA* 1999;281:61–6.

§American Water Works Association. *Water chlorination principles and practices: AWWA manual M20*. Denver, Colorado: American Water Works Association, 1973.

Source: Centers for Disease Control, *Morbidity and Mortality Weekly Report* series (<http://www.cdc.gov/mmwr/PDF/wk/mm4829.pdf>).

Much of the existing research comes from the studies of England by Thomas McKeown (1976), who documented the major decline in mortality caused by airborne infectious diseases (e.g., tuberculosis, bronchitis, pneumonia, and influenza) and by water and foodborne diseases during the early 1900s. For the United States, McKinlay and McKinlay (1977) show patterns of decline in mortality from a number of illnesses. They argue that improved sanitation, reductions in animal dung and chimney smoke, and improved fire protection were major factors. Public health measures that are given credit include immunizations, quarantines, and sanitary handling of foodstuffs, in addition to the factors studied by Costa and Kahn.

Nearly all of the evidence presented by Costa and Kahn is tied to mortality rates. But are these good indicators of health, and are they responsive to improvements in public health? Death registration has been reliable and consistent for only about last 50 years; the identification of disease or cause of death remains incomplete and inaccurate. There have also been changes in the ethnic composition of the population. So, even though we have data on deaths, are they sufficiently accurate for particular geographic areas to capture the role of public health measures?

Overall mortality rates may be reasonably accurate but, depending on its nature, a disease may cause immediate death or have an extended period of latency. To the extent that causes of death are of the latter variety, it will be harder to link mortality improvements to any policy or public health initiative.

Choosing infant and child deaths as a measure makes sense, for deaths of children younger than 5 accounted for more than 30 percent of all deaths in 1900. Disease-specific causes of death are more troublesome. Technology and the ability to diagnose changed over this time period.¹ Numerous studies have suggested that cause of death was substantially misclassified.

¹For example, according to the CDC (1999), “Serologic testing came into use in the 1910s and has become a basic tool to diagnose and control many infectious diseases. Syphilis and gonorrhea, for example, were widespread early in the century and were difficult to diagnose, especially during the latent stages. The advent of serologic testing for syphilis helped provide a more accurate description of this public health problem and facilitated diagnosis of infection.” p. 625.

Furthermore, death may result from a complex of conditions and the one noted in the records may reflect a currently fashionable diagnosis rather than the primary cause of death. Fashions differ across geographic areas and change over time, suggesting there is need for caution in interpreting the ties between public health measures and a decline in cause-specific mortality rates. .

McGinnis and Foege (1993), talking of more recent times, comment:

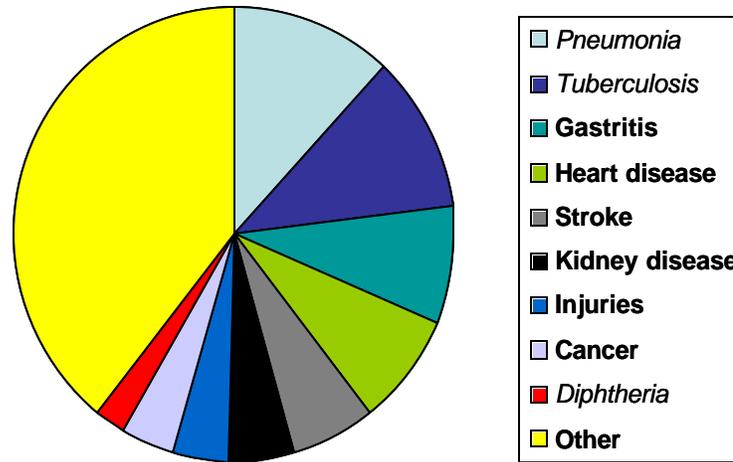
In 1990, approximately 2 148 000 US residents died. Certificates filed at the time of death indicate that their deaths were most commonly due to heart disease (720 000), cancer (505 000), cerebrovascular disease (144 000), accidents (92 000), chronic obstructive pulmonary disease (87 000), pneumonia and influenza (80 000), diabetes mellitus (48 000), suicide (31 000), chronic liver disease and cirrhosis (26 000), and human immunodeficiency virus (HIV) infection (25 000). Often referenced as the 10 leading causes of death in the United States, they generally indicate the primary pathophysiological conditions identified at the time of death, as opposed to their root causes. These conditions actually result from a combination of inborn (largely genetic) and external factors. Because most diseases or injuries are multifactorial in nature, a key challenge is sorting out the relative contributions of the various factors. For heart disease, well-established external risk factors include tobacco use, elevated serum cholesterol levels, hypertension, obesity, and decreased physical activity; for various cancers, such risk factors include tobacco use, dietary patterns, certain infectious agents, and environmental or occupational exposure to carcinogenic agents. Even motor vehicle injuries can be associated with multiple factors, including alcohol use, failure to use passenger protection systems, poor roadway design, and inadequate law enforcement. These factors may act independently of each other, the risks being additive according to the effect of each, or they may act synergistically, the interaction of factors presenting a greater total risk than the sum of their individual effects.

Thus establishing the causes for declines in mortality rates and improvements in health in the early 1900s is an inexact science and an area of considerable controversy.

In the authors' analysis of diseases and causes of mortality, the diseases they selected did not include all the major causes of death at the time, as Figure 2 shows.

Source:

Causes of Death, 1900



Source: **FIGURE 2. The 10 leading causes of death as a percentage of all deaths — United States, 1900 and 1997.** [Achievements in Public Health, 1900-1999: Control of Infectious Diseases](http://www.cdc.gov/mmwr/PDF/wk/mm4829.pdf) Vol 48, *Morbidity and Mortality Weekly Report*. No 29;621 07/30/1999
<http://www.cdc.gov/mmwr/PDF/wk/mm4829.pdf>

Costa and Kahn include only those in italics. Certainly, they include two of the three leading causes of mortality, but it would be of considerable interest to expand the analysis to other important conditions.

Even at its best, mortality is an extreme measure. I hope that future research can be extended to other indicators of health. Quality of life and disabilities, for example, are also relevant.

Other factors are likely to be tied to a decline in mortality rates in this era

A variety of factors not yet included in the Costa Kahn analysis are also likely to be important determinants of the health outcomes that they study. Some trends may be a result of naturally occurring patterns. An example of this is the role of Herd Immunity (before vaccinations became widespread), the idea that persons with any particular disease develop an immunity which stops the spread of the disease. In these circumstances we should be able to

observe a natural pattern of decline and subsequent increase without any public health interventions—measles is the most commonly used example (Hedrich, 1933). This concept, however, is yet to be explored in the context of the issues analyzed in this chapter.

Other factors generally acknowledged to be important to health include nutrition, education, and income. Since 1900, safer and healthier foods have resulted from decreases in microbial contamination and increases in nutritional content. Recall the description of the meat industry in Upton Sinclair's *The Jungle* (1906), which so graphically captures the lack of sanitation in the meat packing industry in the early years of the twentieth century:

There would be meat that had tumbled out on the floor, in the dirt and sawdust, where the workers had tramped and spit uncounted billions of consumption germs. There would be meat stored in great piles in rooms; and the water from leaky roofs would drip over it, and thousands of rats would race about on it. It was too dark in these storage places to see well, but a man could run his hand over these piles of meat and sweep off handfuls of the dried dung of rats. These rats were nuisances, and the packers would put poisoned bread out for them; they would die, and then rats, bread, and meat would go into the hoppers together (to be made into sausage). [Chapter 14]

The dramatic decrease in typhoid from about 1900 to 1920 is associated with the improvement in the safety of the food supply. Milk pasteurization, which dates from about 1910, is thought to have significantly reduced infant and child deaths. The development of much of our initial knowledge about vitamins also took place during the later part of this time period.² The identification of essential micronutrients and the establishment of food-fortification programs have almost eliminated major nutritional deficiency diseases such as rickets, goiter, and pellagra in the United States. Robert Fogel (1997) suggests that perhaps 40 percent of the decline in mortality is due to improved nutrition. Others argue either more or less. Surely, however, food supply and other indicators of nutrition should be included in this analysis. It would be interesting to learn how these improvements were financed and implemented.

²The discovery that food contained vitamins dates back to 1916. Food fortification followed as another form of public health intervention.

New agencies played important roles in improving health. For example, the Children's Bureau was established about 1915, initiating the public sector's involvement in improving the health of mothers and infants. Quarantine and ship inspections and rodent control activities (conducted by the Public Health Service and its precursor, the U.S. Marine Hospital Service) along with state and county programs are examples of other programs that may well have contributed to the rapid improvement in health in the early twentieth century.

The idea that these other factors are likely to be important in understanding the tremendous improvements in health calls for a study that includes such factors as the proportion in a population that are literate, the incidence of extreme poverty, indications of the availability of food and its quality, and some measure of food safety.

Finally, this provocative chapter will, I hope, lead others to go further, both to uncover the determinants of the decline in mortality and to test again the role of specific public health measures. Few economists or public policy analysts have ventured here; I hope more will in the future. Much can be learned that is relevant to tackling today's public health problems.

A Few Minor Points

1. The authors state: "In 1913, the United States was spending twice as much on hospitals and health as it was on public poor relief and welfare (Lindert 2004). In contrast, in 1980 the United States was spending three times as much on public poor relief and welfare as hospitals and health for the poor."

The evidence seems to run against this. For example, in 1980 we were spending about 118 percent of the amount spent on cash transfers on Medicaid.

2. The authors state that political variables, specifically, party affiliation of elected officials, predict state and local spending. I would argue that the factors that lead a state or region of a state, for example, to elect a Democratic representative may be the very factors that explain

greater spending. Electing Democrats is better viewed as reflecting the preferences of the population (that is, it is endogenous) rather than as an explanation.

3. In predicting patterns of immigration it might be useful to include country of origin. That is, if many Irish lived in a particular area, and the next wave of immigrants were largely Irish, we would expect to see a pattern of location among the later wave that followed early immigrants from Ireland. This might improve our understanding of the existing patterns and perhaps strengthen the test of the role of redistribution.

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