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Sixth Edition

THE ECONOMICS OF HEALTH AND HEALTH CARE

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What Caused the Mortality Rate Declines? Was It Medicine?

Many presume that the declines in the mortality rates were due to improvements in medical science provided to the public through medical practice, but counterarguments to this proposition bring it into question. In most cases, an effective specific medical intervention was not available until late in the period, well after the greater part of the mortality decline had occurred.

The argument can be illustrated for the cases of respiratory tuberculosis and a group of three upper respiratory diseases—bronchitis, pneumonia, and influenza. Mortality rates for these diseases fell to relatively low levels prior to the availability of effective medical interventions, whose availability occurred respectively after 1930, and for some cases well into the 1950s and 1960s. The picture is shared by waterborne diseases. About 95 percent of the mortality declines in cholera, diarrhea, and dysentery occurred prior to the 1930s, when intravenous therapies became available. Likewise, typhoid and typhus mortality already had fallen to low levels by the beginning of the twentieth century. The pattern McKeown found for England and Wales also can be illustrated for the United States. McKinlay and McKinlay (1977) provided data for the United States from 1900 to 1973. Figure 5-3 shows these patterns for several infectious diseases. In most cases, as is shown, the availability of the effective medical intervention occurs well after the majority of the mortality declines.

One of the most important changes in mortality in the twentieth century was the decline in infant mortality. Does this type of mortality follow the same pattern? A highly readable account of the modern historical pattern of infant mortality is offered in Victor Fuchs's *Who Shall Live?* (1974). Fuchs noted that infant mortality rates in New York City improved markedly from 1900 to 1930 and that this decline was due to declines in deaths from "pneumonia-diarrhea" complex. Fuchs concluded: "It is important to realize that medical care played almost no role in this decline. While we do not know the precise causes, it is believed that rising living standards, the spread of literacy and education, and a substantial fall in the birth rate all played a part" (p. 32).

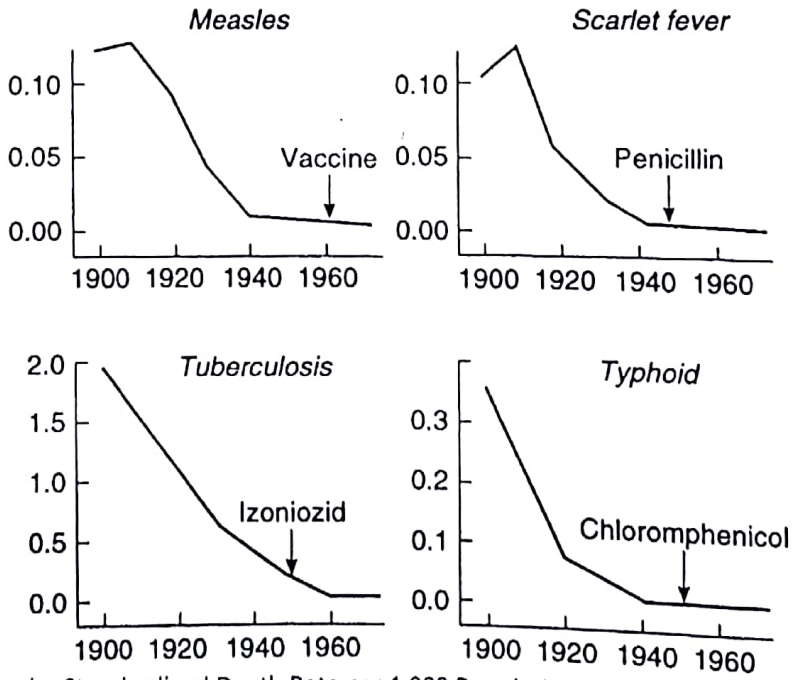

FIGURE 5-3 Fall in the Standardized Death Rate per 1,000 Population for Four Common Infectious Diseases in Relation to Specific Medical Measures for the United States *Source:* Reprinted from *Millbank Memorial Fund Quarterly/Health and Society,* John B. McKinlay and Sonja M. McKinlay, "The Questionable Contribution of Medical Measures to the Decline of Mortality in the United States in the Twentieth Century, *Millbank Memorial Fund Quarterly/Health and Society 55* (1977): 405–428, with the permission of Blackwell Publishers.

Antimicrobial drugs were introduced in the 1930s. Between 1935 and 1950, the fall in infant death rates accelerated. Fuchs proposed that during this period "both medical advances and rising living standards contributed to the reduction in infant deaths" (p. 32). Declines in infant deaths flattened somewhat beginning about 1950 but resumed a stronger decline about 1965. If specific effective curative medicines were not largely responsible for mortality declines, is it nevertheless possible that other tools in the physician's black bag were effective? Unfortunately this too is unlikely. The problem is that there probably were few effective tools available until well into the twentieth century. Even a clear knowledge of what caused disease was not widespread until the 1900s.

NUTRITION REDUCED MORTALITY Two of the most respected students of the mortality decline, medical historian Thomas McKeown (1976) and economic historian Robert Fogel (2004), argued strongly that the main cause was improved nutrition. McKeown reasoned by process of elimination. As we have just seen, he showed the medicine interventions could not have been the cause, a claim that is still widely accepted. He considered other possibilities one by one. For example, it had been suggested that perhaps the infectious organisms had spontaneously mutated and became harmless; he pointed out that the chances were remote that so many independent organisms had randomly mutated at about the same time.

McKeown also dismissed public health as a major cause, however, and this argument was to become controversial. Let us examine his argument that public health's contribution was minor. If we reexamine his work in Table 5-1, we see that the largest portion of mortality decline from 1848 to 1971 was due to declines in mortality from airborne diseases. He argued that public health projects, which focused on improving water quality and the safety of food, could have little effect on airborne diseases. McKeown clearly understood that clean water and pasteurized milk were important to improved health, but he claimed that these benefits came late in the historical era of mortality declines. Supporting his claim about the timing of public health, consider that the role of germs was not understood until the mid-1800s, about the time that public health came into being, and pasteurization of milk did not start until around 1870 and its widespread commercial use did not come until well into the twentieth century. Having eliminated everything else, in his reasoning, McKeown assumed that the great benefactor that transformed the developed countries from high mortality to low mortality must have been improved nutrition.

This argument for the primacy of nutrition, however, provided no direct evidence that nutrition improves health. Robert Fogel (2004) provided that needed evidence. He established that after the mid-eighteenth century, caloric intake of Europeans increased tremendously. At about the same time, their average height also increased substantially. The relationship of height to health is now well known; the Waaler Curve established that for any given body mass taller people (up to a point) have greater life expectancy (Fogel, 2004). We also now understand how better nutrition makes an individual better able to resist infectious disease. Fogel went on to study in great detail the heights and records of Civil War soldiers in the United States. His research led him to claim that nutrition played the major role in what the title of his recent book calls: *The Escape from Hunger and Premature Death, 1700–2100.*

PUBLIC HEALTH REDUCED MORTALITY Other historical analysts take issue with the proposition that nutrition was the main cause of the mortality reductions. The crux of the issue is when the era of mortality reductions began. Public health advocates claim contrary to McKeown that the major declines did not start until around 1870, and if they began this late, then public health, which began about 1850, would have come in time to contribute. We know that the era from 1870 to about 1940 completed the "epidemiological transition." This phrase describes the remarkable transition in developed countries from when infectious disease was the major cause of death to a time when it became of only minor importance to population health. It is instructive to examine what public health accomplished during this period.

By 1870, cities had grown rapidly without the planning and development we now consider to be essential to a healthy environment. During this era, urban centers eventually and painfully slowly

BOX 5-2

The Importance of Clean Water

If transported by time machine back to the mid-nineteenth century, you would find it difficult to survive. This is because your modern body mass and height could barely be sustained by the small average quantities of available calories. But if you did survive and went to live in a city, you would find that in your weakened condition you would be very susceptible to infectious disease organisms permeating your environment, and especially in the water.

Even in 1900, waterborne infectious disease accounted for one-quarter of the deaths from infectious disease. Public health campaigns, which were painfully slow in gaining acceptance, cleaned up the water. They introduced the filtering of city water through sand. They fought to have sewage discharged at a safe distance from water intakes. In prior cases, cities had discharged waste directly into the same lakes or streams where drinking water was taken. Water closets were introduced in about 1870, and these discharged human waste into a city sewer system that often could not handle it and overflowed even into the streets. Public health also introduced chlorination of the water supplies. If the earlier contaminating practices seem obvious and foolish to us, we need to remember that germ theory had only recently arrived, and pasteurization was discovered only in the late 1800s.

Cutler and Miller (2005) estimate that filtration of city water brought reductions in total mortality of 16 percent and reduced infant mortality by 43 percent in the 12 American cities studied. Applying cost-benefit principles, the researchers found that the ratio of benefits to costs in the filtration projects was about 23 to 1. This is history to us, but it is present-day reality to lesser developed countries, where over 1 billion people lack access to clean water (Cutler and Miller 2005). The United Nations has declared the 2005–2015 period the International Decade for Action on Water. More on the U.N. program can be found on the Web by searching for "millennium development goals."

overcame their status of having worse mortality rates and general health than the countryside, the "urban deficit." Streets contained animal excrement, sewer systems were designed mainly for storm water, and water supplies were often delivered in lead pipes. The transition from water tainted with infectious organisms to clean water supplies was the most dramatic change in the health environments of city dwellers (see Box 5-2, "The Importance of Clean Water," for this story).

To summarize, the overall period, from 1750 to the present, contains three strands of health-related phenomena: (1) growth in life expectancy; (2) improved nutrition; and (3) improved public health. The difficulty is how to sort out which relationships proved most important. We see the importance of nutrition to body mass and height, the keys to health in the Waaler Curve (Fogel, 2004): compelling evidence. But those who believe that public health was of key importance can point to the cleanup of cities: also compelling evidence. And they point out, for example, that we know the modern Chinese people are not as tall as Americans, yet their life expectancies are much higher than would have been expected. Does not this point to the modern adoption of public health measures, which now can take place very rapidly? We will see shortly that these historical puzzles are not merely of "academic" interest but are critical for the growth in well-being of the lesser developed world.

What Lessons Are Learned from the Medical Historian?

While researchers debate the relative importance of nutrition or public health in the dramatic historical decline of mortality rates, there is widespread acceptance of the proposition that medical practice had little to do with it. What implications for modern health policy can we draw from the historians?

First, we cannot conclude that medical research is unimportant in history or in the present day. Medical research contributes not only through improvements to medical practice, but also through its influence on health-enhancing practices. Typhoid provides a good example. As we have seen, mortality from typhoid declined substantially well before the arrival by 1950 of chloramphenicol. Medical research, however, contributed to our understanding of the cause and transmission of