**Determinants of the Historical Decline in Mortality**

For most of human history, life was properly described in the famous phrase of Thomas Hobbes as “nasty, brutish, and short.” From the dawn of Homo sapiens perhaps 100,000 years ago until the first agricultural revolution in roughly 10,000 BCE, world population was about four million people. Life expectancy at birth for our hunter–gatherer ancestors was perhaps 25 years. There had been little, if any, progress by the Roman Empire, and even in 1700, life expectancy at birth in England—after the Netherlands, the richest country in the world at the time—was only 37 years (Wrigley and Schofield, 1981).

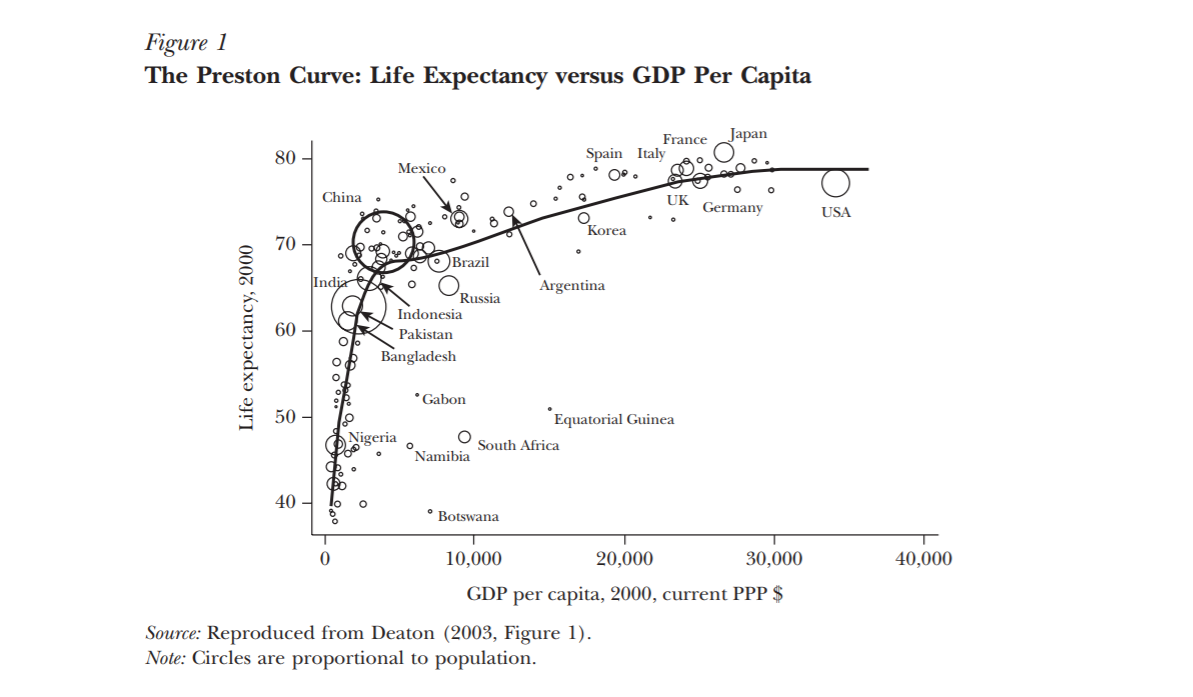
In the eighteenth century, mortality began to decline. In England and Wales (which we refer to as “England” for convenience), the decline started around the middle of the eighteenth century. A similar transition, with some moderate differences in timing, took place in all developed countries. Mortality reduction in France was broadly similar to that in England. In the United States, the mortality reduction appears to start around 1790, with a similar overall pattern. Life expectancy at birth in the United States rose from 47 years in 1900 to 78 years today.

In India and China, life expectancies have risen by nearly 30 years since 1950 and, even in Africa, where there has been much less economic progress, life expectancy rose by more than 13 years from the early 1950s to the late 1980s, before declining in the face of HIV/AIDS.

The following are some of the factors that played an influencing role in controlling mortality rates.

**Improved Nutrition**

Agricultural yields increased significantly during the eighteenth century. Better fed people resist most bacterial (although not viral) disease better and recover more rapidly and more often. The British physician and demographer Thomas McKeown was the first person to argue for the importance of nutrition in improved health. Direct evidence on the role of nutrition in improved health and mortality reduction comes from the work of Robert Fogel, in a series of papers summarized in Fogel (1997) and in his 2004 book. There are powerful two-way interactions between disease and nutrition (Scrimshaw, Taylor and Gordon, 1968). Children who are frequently malnourished often continually suffer from poorly-controlled infectious disease. Diseases such as diarrhoea prevent food intake from nourishing the body; children who suffer repeated episodes of diarrhoea may be able to digest less than 80 percent of what they consume (Dasgupta and Ray, 1990).



**Public Health**

The argument for the role of public health in reduced mortality is made most prominently by Samuel Preston (1975, 1980, 1996). If economic growth were the sole reason for improved health, countries would move along the “Preston curve” shown in Figure 1, but the curve itself would remain fixed. However, even at a given level of income, people live substantially longer today than they did in the past. For example, China in 2000 has the income level of the United States in the 1880s, but has the life expectancy of the United States in 1970—about 72 years. Preston estimates that only about 15 percent of the increase in life expectancy between the 1930s and 1960s is a result of increases in income alone (Preston, 1975).

Public health improvements are an obvious explanation for this shift. Macro public health involves big public works projects: filtering and chlorinating water supplies, building sanitation systems, draining swamps, pasteurizing milk and undertaking mass vaccination campaigns. Micro public health involves changes made by individuals but encouraged by the public sector, including boiling bottles and milk, protecting food from insects, washing hands, ventilating rooms and keeping children’s vaccinations up to date. Macro public health was always present to some extent.

**Urbanization**

If rising living standards were good for health, urbanization was not, at least initially. The preponderance of the evidence suggests that the lack of improvement in mortality between 1820 and 1870 was due in large part to the greater spread of disease in newly enlarged cities. Nutrition may or may not be the culprit here; debate about whether nutrition and real wages were rising or falling in the middle of the nineteenth century continues to rage. But the effect of unsanitary conditions was larger and the spread of disease was easier in bigger, more crowded cities.

**Vaccination**

Prior to the twentieth century, there was little effective medical treatment for infectious disease. Over the course of the twentieth century, however, the role of medical advances increased in importance. The first important medical interventions were vaccinations. Variolation against smallpox, practiced in China as early as the tenth century, was an early form of immunization whereby matter from the scabs of previous victims was introduced into the bodies of healthy people. Variolation was introduced to Europe from Turkey and to the American colonies by African slaves in the early eighteenth century. George Washington variolated his entire army. Vaccination was introduced by Edward Jenner at the end of the eighteenth century, but wide-scale research on vaccines depended on the germ theory of disease and did not occur until a century later. Since the late nineteenth century, there have been a number of new vaccines, including those for rabies (1885), plague (1897), diphtheria (1923), pertussis (1926), tuberculosis (1927), tetanus (1927), yellow fever (1935), polio (1955 and 1962), measles (1964), mumps (1967), rubella (1970), and hepatitis B (1981).

**Medical Treatments**

Quantitatively more important for mortality was the development of new therapeutics for people with disease. Figure below shows mortality for infectious diseases and cardiovascular disease. Infectious disease declined greatly in the first half of the century, while cardiovascular disease mortality reductions were particularly important after 1960. Antibiotics, developed in the 1930s and 1940s, were the first of the new wave of medical therapies. Sulfa drugs and penicillin were the wonder drugs of their era. By 1960, mortality from infectious diseases had declined to its current level.

