Life expectancy and changing mortality*

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The spectacular increases in human life expectancy that began in the mid-1800s and continued during the following century are often ascribed primarily to improvements in medicine. However, the major impact of improvements both in medicine and sanitation did not occur until the late nineteenth century. Earlier and more important factors in lowering mortality were innovations in industrial and agricultural production and distribution, which improved nutrition for large numbers of people (1). A growing research consensus attributes the gain in human longevity since the early 1800s to a complex interplay of advancements in medicine and sanitation coupled with new modes of familial, social, economic, and political organization (2).

LIFE EXPECTANCY AT BIRTH EXCEEDS 78 YEARS IN 28 COUNTRIES

Life expectancy at birth in Japan and Singapore has reached 80 years, the highest level of all the world’s major countries, and has reached 79 years in several other developed nations (e.g., Australia, Canada, Italy, Iceland, Sweden, and Switzerland). Levels for the United States and most other developed countries fall in the 76-78 year range (Fig. 1). Throughout the developing world, there are extreme variations in life expectancy at birth. While the levels in some developing nations match or exceed those in many European nations, the normal lifetime in many African countries spans fewer than 45 years. On average, an individual born in a more-developed country can now expect to outlive his/her counterpart in the less-developed world by 13 years (see Notes 1 and 2 at the end of text).

TWENTIETH CENTURY LIFE EXPECTANCY HAS DOUBLED IN SOME DEVELOPED COUNTRIES

Table 1 shows the enormous strides that countries have made in extending life expectancy since 1900. In developed countries, the average national gain in life expectancy at birth was 66 percent for males and 71 percent for females during the period 1900-90. In Italy, life expectancy at birth for women increased from 43 years in 1900 to over 82 years in 2000. In some cases, life expectancy has more than doubled during the century (e.g., Spain).

Increases in life expectancy were more rapid in the first half than in the second half of the century. Expansion of public health services and facilities and disease eradication programs greatly reduced death rates, particularly among infants and children. From 1900 to 1950, people in many Western nations were able to add 20 years or more to their life expectancies.

Reliable estimates of life expectancy for many developing countries prior to 1950 are unavailable. Since World War II, changes in life expectancy in developing regions of the world have been fairly uniform. Practically all nations have shown continued improvement, with some exceptions in Latin America and more recently in Africa, the latter due to the impact of the HIV/AIDS epidemic. The most dramatic gains in the developing world have been in East Asia, where life expectancy at birth increased from less than 45 years in 1950 to more than 72 years today.

TREND IN RISING LIFE EXPECTANCY MAY BE CHALLENGED

While global gains in life expectancy at birth have been the norm, unforeseen changes and epidemics may reverse the usual historical pattern. Beginning in the 1950s, the typical sustained increase in life expectancy at birth in developed countries began to take different paths. While female life expectancy continued to rise virtually everywhere, male gains slowed significantly and in some cases leveled off. From the early 1950s to the early 1970s, for example, male life expectancy changed little in Australia, the Netherlands, Norway, and the United States. After this period of stagnation, male life expectancy again began to rise.

In Eastern Europe and the former Soviet Union,
the pace of improvement in the 1950s and early 1960s was extraordinary. Advances in living conditions and public health policies combined to produce large declines in mortality by reducing some major causes of death (e.g., tuberculosis) to minimal levels (6). Resultant gains in life expectancy in excess of 5 years per decade were common. By the mid-1960s, however, the rate of increase had decelerated sharply. In the 1970s and 1980s, changes in female life expectancy at birth were erratic, while male life expectancy fell throughout the region (7). Following the demise of the former Soviet Union, the decline has continued into the 1990s in some countries. The decline has been particularly severe for Russian men; between 1987 and 1994, male life expectancy at birth plummeted 7.3 years to a level of 57.6 years. Life expectancy began to improve after 1994, only to suffer another decline beginning in 1998 (Fig. 2). The large increases in adult male mortality usually are attributed to a combination of factors including increased homicide and accident rates, excessive alcohol consumption, poor diet, and environmental/workplace degradation (9, 10), although most researchers take pains to point out that clear causal mechanisms remain poorly understood.

Elsewhere, the HIV/AIDS epidemic has had a devastating impact on life expectancy, particularly in parts of Africa. The effect of the epidemic on life expectancy at birth may be considerable, given that AIDS deaths often are concentrated in the childhood and middle adult (30 to 45) ages. Projections to the year 2010 suggest that AIDS may reduce life expectancy at birth by more than 30 years from otherwise-expected levels in countries such as Botswana, Namibia, South Africa, and Zimbabwe. And while the common perception of AIDS mortality usually associates AIDS deaths with children and younger adults, the epidemic may have a direct and growing effect on older populations. In the United States in 1992, nearly three times as many people aged 60 and over died of AIDS as did people under age 20. Between 1987 and 1992, the annual number of U.S. children who died of AIDS remained relatively stable, whereas the number of deaths to people aged 60 and over nearly doubled (11).

**FEMALE ADVANTAGE IN LIFE EXPECTANCY NEARLY UNIVERSAL**

The widening of the sex differential in life expectancy has been a central feature of mortality trends in developed countries in the twentieth century. In 1900, in Europe and North America, women typically outlived men by 2 or 3 years. Today, the average gap between the sexes is roughly 7 years, but exceeds 12 years in parts of the former Soviet Union as a result of the unusually high levels of male mortality discussed above (Fig. 3). This differential reflects the fact that in most nations females have lower mortality than males in every age group and for most causes of death. Female life expectancy now exceeds 80 years in over 30 countries and is approaching this level in many other nations. The gender differential usually is smaller in developing countries, commonly in the 3-6 year range, and even is reversed in some South Asian and Middle East societies where cultural factors (such as low female social status and pref-