

Figure 2-33 Health services per capita versus life expectancy
Sources: WHO 1971; Keyfitz and Flieger 1971.

Since 1900 a steady and spectacular advance in medical knowledge has extended the maximum life expectancy at birth in the most advanced nations to about 74 years. At the same time, advances in public health technology (for example, manufacture and shipment of vaccines, water and sewage treatment facilities, and insecticide sprays) have greatly decreased the cost of administering basic medical and preventive techniques to the general public. For example, Figure 2-33 shows the relationship in various nations between total health service expenditures and life expectancy. Apparently, an expenditure of as little as 20 dollars per capita per year with present technology is sufficient to raise life expectancy dramatically. Thus a graph of the lifetime multiplier from health services LMHS as a function of effective health services per capita EHSPC today would be quite different from one in 1900, and in 1990 the graph may be different from the relevant one today. Examples of hypothetical graphs for these three dates are shown in Figure 2-34.

The occurrence of a relationship that appears to be time-dependent, like the one in Figure 2-34, indicates that an important underlying dynamic function has been omitted from the model. In this case both the effectiveness and the cost of medical care are dependent upon a slow accumulation of medical and technical knowledge. The dynamics of this technological progress might be introduced into the model by including explicit representation of the past investment in medical research and development and of the time delays involved in testing and implementing new medical discoveries. We chose a simpler approach here by making two assumptions about the historical path of health technology:

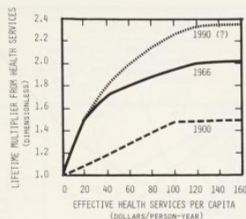


Figure 2-34 Lifetime multiplier from health services, 1900, 1966, 1990

1. Past medical progress, although it accumulated gradually, was first widely available on a global scale in the 1930s and 1940s.
2. Present medical technologies in the industrialized countries have reached a plateau as far as raising life expectancies are concerned and are not likely to increase life expectancies much beyond the present 70–75 year average, even with increased research investment.

The transition from the health technology of 1900 to that of 1966, as shown in Figure 2-34, certainly did not take place suddenly. Nevertheless, there is some evidence that the major developments responsible for the application of new medical knowledge (the reduction of costs) occurred quite rapidly during the period between 1925 and 1945. For example, Figure 2-35 shows the slow and gradual increase in life expectancy over 200 years in Sweden and the sudden spurts in life expectancy in several developing countries after 1920. Figure 2-36 shows a similar comparison for the countries of Latin America. Arriaga and Davis (1969) conclude from these figures that some major change in the relationship between the economic level of a population and its life expectancy began to occur about 1930.

In general, the view is often taken . . . that the health of a population is a function of the economic level. Since economic development involves the entire society, it is a process that tends to be ponderous, relatively slow and somewhat regular over the long pull. Anything that depends on this process could be expected to share the same traits. Furthermore, . . . the life expectancy in a population [might be expected to be] an index of its economic stage.

. . . up to about 1920 or 1930 these deductions appear to be true. . . . After 1930, however, . . . the rate of mortality change was extremely rapid, no matter whether the economy was booming or not. . . .

At the present, regardless of the state of development of a country, certain public health and medical techniques can be applied—principally those measures whose applications are not expensive. . . . As a consequence, a backward country can succeed in combatting a particular infectious-communicable disease without having to develop or maintain a major medical establishment of its own. [Arriaga and Davis 1969]