

LIFE EXPECTANCY: THE GREAT 20TH CENTURY LEAP

BY JOAN AREHART-TREICHEL

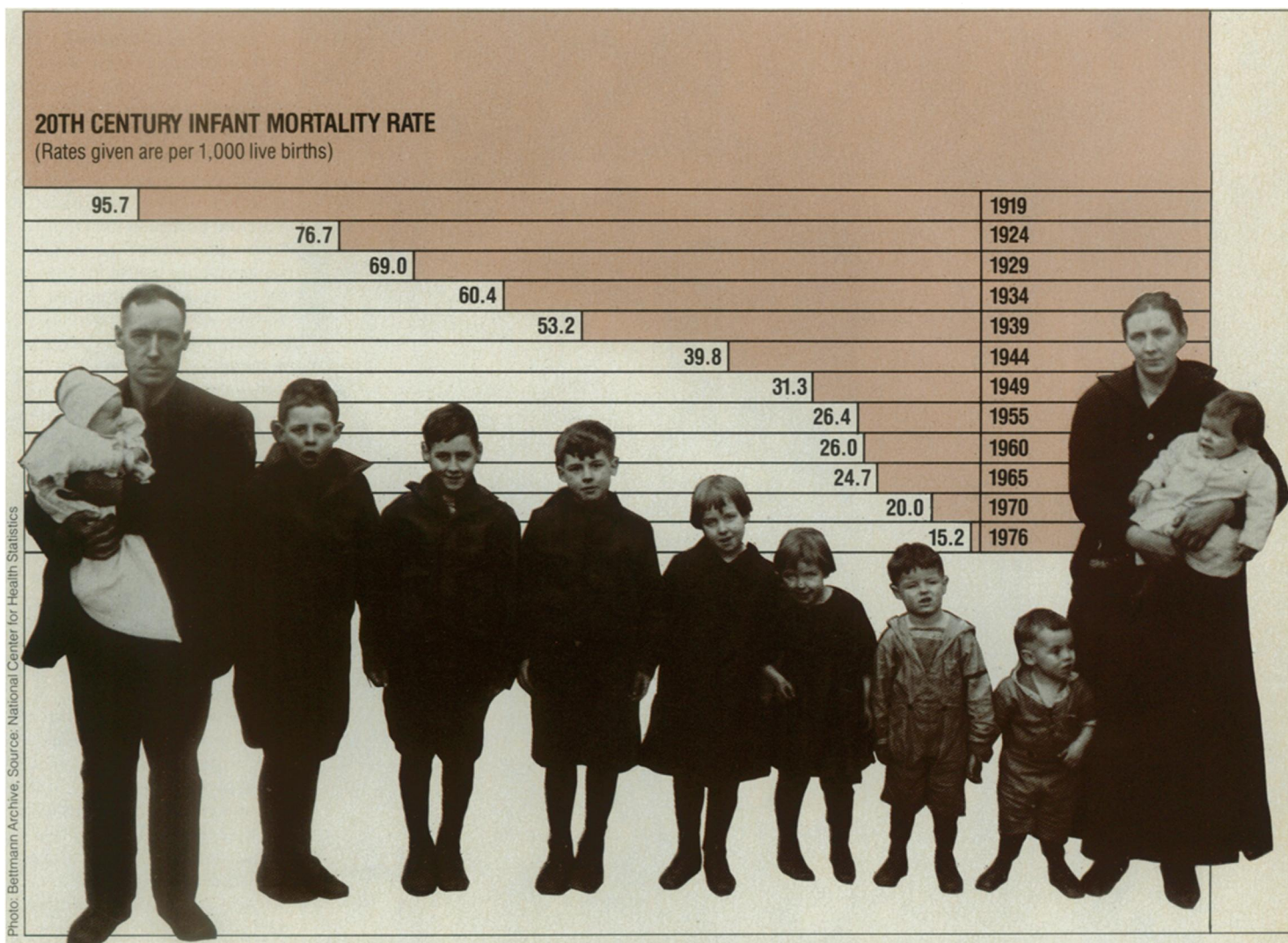


Photo: Bettmann Archive. Source: National Center for Health Statistics

The average life expectancy in the United States and other developed countries has increased as much during the 20th century as during all previously recorded history. The average life expectancy increased 25 years — from 22 years to 47 years — between 2,000 years ago in Rome and A.D. 1900 in the United States. In contrast, the average life expectancy increased 26 years — from 47 years to 73 years — between 1900 and 1978 in the United States.

The major reason for this dramatic jump, scientists and scientific data tend to concur, is not a conquering of diseases of old age, or even of the middle years, but rather of childhood, especially infancy. In fact, just as average life expectancy in the United States during this century has been

steadily soaring, infant mortality rates have been consistently plummeting. The rate in 1900 was 100 per 100,000 births, and in 1980, was 12.5, the lowest ever recorded. As a result, persons who reach age 65 are not living all that much longer today than they did in 1900. Rather, far greater numbers of people are making it to age 65 today than did in 1900 because they are surviving infancy and childhood. In 1900, four out of every 100 Americans reached age 65; in 1977, 10 out of every 100 did.

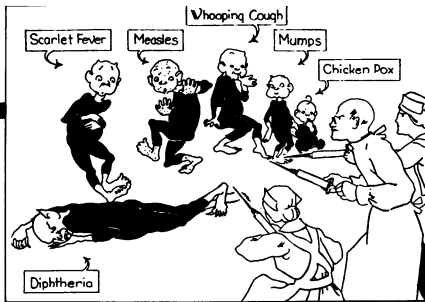
The infancy and childhood disease conquests that have contributed to the dramatic increase in life expectancy include:

- infectious diarrhea — conquered with better education of mothers regarding the importance of hygiene in formula feeding
- noninfectious diarrhea — overcome through clinical and laboratory studies showing that it was due to fluid loss, elec-

- trolyte imbalance and circulatory failure
- pneumonia, meningitis, rheumatic fever and scarlet fever — vanquished with antibiotics
- diphtheria, whooping cough, typhoid and polio — overcome with vaccines
- measles — countered first with sulfa drugs and antibiotics and ultimately with a vaccine.

Such conquests are well illustrated by the number of cases of such diseases that used to occur as compared to those occurring today. For instance, there was a massive polio epidemic in New York City in 1916 and a large outbreak of polio cases there in 1931. Last year there were only six cases of polio in the entire United States, reports Duane Alexander, a pediatrician and special assistant to the Director of the National Institute of Child Health and Human Development in Bethesda, Md. Similarly, there were 20,000 cases of

A conquering of infant and childhood diseases is among the major reasons for the dramatic increase in lifespan in the 20th century



This cartoon, which appeared in a 1927 Science News-Letter, represents the zeal with which researchers faced the goal of eradicating childhood diseases.

childbirth since 1900. One of the primary reasons for the marked drop in maternal deaths was the arrival of prenatal care for pregnant women after 1910. For all practical purposes such care did not exist from 1900 to 1910. Or as one medical observer noted in 1909: "Of the maternity hospitals, it is still unhappily true that they are regarded largely as clinics for the edification of young physicians. With two or three splendid exceptions, the maternity hospitals of New York have no adequate provision for the protection of mothers before childbirth or for following them to their homes after they have been discharged." Still another strong reason for the drop in deaths during childbirth was the adoption of instrument-sterilization techniques by physicians during delivery. This was especially effective in reducing the infection of the vagina with pathogenic bacteria during delivery — the largest single cause of maternal deaths during childbirth in the early 20th century.

Yet another explanation for the marked increase in life expectancy has been the general improvement in sanitation during this century as compared to preceding ones. "It wasn't doctors who were so much responsible for it," asserts Jacob Brody, associate director for the Epidemiology, Demography and Biometry Program at the National Institute on Aging, "[although] they like to take the credit for it. But I suspect that the man who invented screens did more. Certainly the man who invented the flush toilet did more." How far sanitation has come can be easily appreciated by recalling some of the appalling living conditions in the United States between 1850 and 1900. Railway coaches were so crowded and ventilation on them so poor that candles went out for lack of oxygen. Corpses from diphtheria epidemics were shipped on trains without being sealed in caskets. Schools had poor ventilation and dirty water-closets. Poorhouses and jails contained rats and filthy refuse. And as the book *Garbage in the Cities* (Texas A & M University Press, 1982) points out: "As late as the 1860s, Washingtonians dumped garbage and slop into alleys and streets, pigs roamed freely, slaughterhouses spewed nauseating fumes, and rats and cockroaches infested most dwellings — including the White House. No wonder the infant mortality rate was very high in the capital city."

The life expectancy increase — especially in recent years — is also due in part to a decline in deaths from chronic diseases. Deaths from stroke, for example, have been falling since the 1930s or 1940s, Brody says. Deaths from heart disease

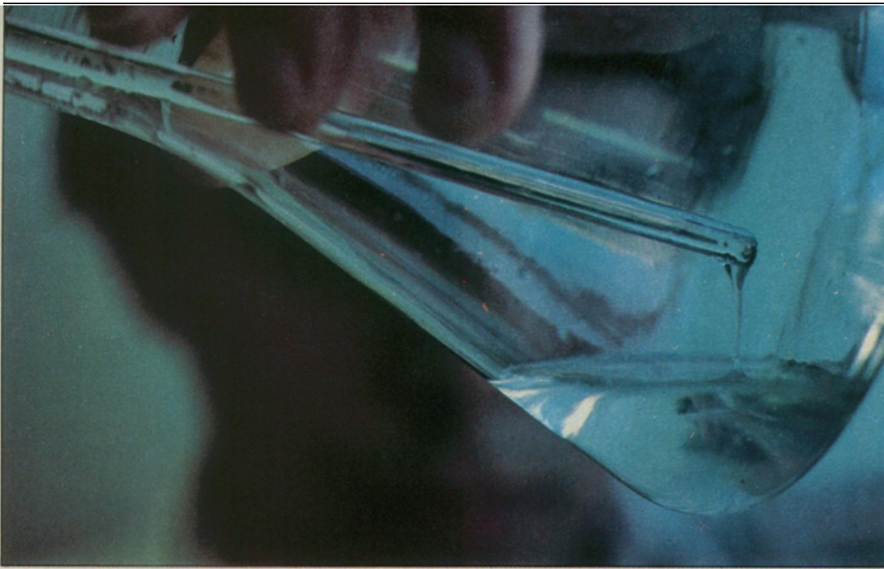
measles a week during epidemics back in the 1930s, whereas there were only 3,000 cases of measles in the United States altogether last year, Alexander says. In 1931, W. T. Harrison of what was then called the National Institute of Health declared that the arrival of a diphtheria vaccine was the greatest public health development since Jenner developed a smallpox vaccine in the latter 18th century. Harrison predicted that diphtheria, once the dreaded scourge of childhood, would disappear in a few more years. He was right. There were only four cases of diphtheria in the United States in 1978, according to Joan Keemer, a statistician with the National Center for Health Statistics in Hyattsville, Md.

A drop in infectious disease deaths among older Americans has, of course, also contributed to the great life expectancy increase during the 20th century. Tuberculosis, for example, was the major

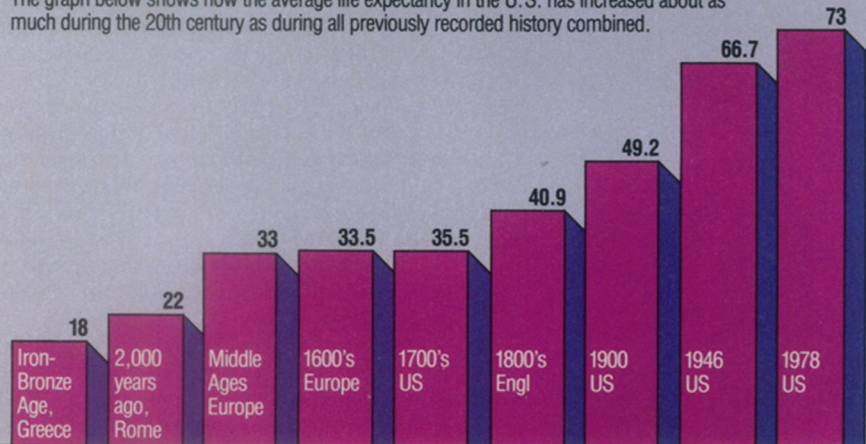
cause of death for young and middle-aged adults at the turn of the century. In 1939 the TB patient was not much better off because there was still no cure. But during the early 1940s antibiotics were found that could cure it. (See accompanying box.) In 1958, the Metropolitan Life Insurance Co. of America reported before the Sixth International Congress on Life Insurance Medicine that the death rate from TB among its policyholders was steadily falling. Today tuberculosis has been virtually eradicated among Americans. Similarly, the development of flu vaccines has spared an increasing number of older Americans from influenza, which was a leading cause of death in 1900. And during the early 1940s antibiotics came into use against pneumonia, which had been a major killer of persons age 40 and over.

Another factor has been a 100 percent decline in deaths among women during

Claude Edelmann/Petit Format et Guigoz. From the book *First Days of Life*



The graph below shows how the average life expectancy in the U.S. has increased about as much during the 20th century as during all previously recorded history combined.



Louis Pasteur

If any one medical research advance can be credited for the remarkable increase in life expectancy during the 20th century, it might well be the discovery and development of antibiotics.

The first real demonstration of an antibiotic effect — that is, of some microbes antagonizing others — came in 1877 when two French scientists, Louis Pasteur and Jules-François Joubert, found that bacteria responsible for an infection called anthrax grew rapidly if put in urine free of common air bacteria but died if common air bacteria were present. They then found that if these

common air bacteria were injected into experimental animals, the bacteria responsible for anthrax did not cause the disease in the animals.

Then in 1928 came the discovery of the first antibiotic — that is, of the chemical weapon made by one microbe that is capable of thwarting the actions of another microbe. The British bacteriologist Alexander Fleming observed that a culture of the disease-causing bacterium *Staphylococcus aureus* disappeared in an area where a green mold called *Penicillium* was growing. Fleming then cultivated the mold and isolated the chemical from it that was able to counter *Staphylococcus*. He named the substance "penicillin."

By 1940 three groups of microbes — fungi, bacteria and actinomycetes — had been shown capable of producing antibiotics against disease-causing bacteria. Selman Waksman, the scientist who coined the term "antibiotic," wrote: "We are finally approaching a new field of domestication of microorganisms for combating the microbial enemies of man and of his plants and animals."

From 1940 to 1945 many scientists developed antibiotics, tested them on animals, produced them in large batches and tested them on patients. Penicillin and several others were found to be effective in countering disease. In 1943 penicillin became available for treating diseases of both childhood and maturity. After that, many others followed, and the age of antibiotic therapy was underway.

—Joan Arehart-Treichel

Just as antibiotics and vaccines helped extend life span during the earlier 20th century, interferon, insulin and other drugs made with recombinant DNA techniques may do the same during the rest of the 20th century and beyond.

have been plummeting markedly since the 1960s (SN: 11/11/78, p. 328). In fact, deaths from many causes have been going down among Americans since the 1950s or 1960s, Brody points out, and this decline has been the most prominent among the elderly.

So will the average life expectancy continue to soar during the remaining years of the 20th century as it has during the decades to date? It will probably continue to increase, but not at nearly the same pace, scientists tend to agree. For instance, John R. Seal, special assistant to the Director for Research Related to Disease Prevention at the National Institutes of Health, predicts that it will slowly increase to around age 85.

Part of that increase would probably come from a continued drop in heart disease; the National Center for Health Statistics has estimated that if heart disease were totally eliminated from the United States, the increase in life expectancy from birth would be 5.86 years. The drop in heart disease, in turn, would probably ensue from continued advances in heart disease research as well as from Americans living increasingly healthy lives (SN: 10/6/79, p. 230; 12/22 & 29/79, p. 423). The projected, continued increase in life expectancy would undoubtedly also come from an increasing number of effective treatments for cancer and from Americans taking more preventive measures against cancer (SN: 1/3/81, p. 12), although NCHS statistics show that even if cancer were entirely eliminated from the American population, it would increase average life expectancy by only 2.47 years.

But probably the biggest contributor to an ongoing increase in life expectancy will be the further reduction of the American infant mortality rate. For, as Alexander points out, "The first year of life is still the most dangerous year in terms of death until you get well beyond 65. There are more deaths in that year than in any other year. So if you want to improve life expectancy, which is tabulated from birth, infant mortality in the first year of life is the place to focus."

Perinatal researchers are finding, for instance, that low-birthweight babies currently constitute two-thirds of all American infant deaths. Two important contributors to low birthweight are low-socioeconomic status of mothers and vaginitis and other genitourinary infections during pregnancy. Such findings should help obstetricians and pediatricians bring the infant mortality rate still lower and thus increase the American average life expectancy proportionally. □