

# Mortality Transitions in Human History

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The expectation of life at birth has increased from about 20 years for early man to about 80 years in countries at high levels of economic and technological development today. Underlying this spectacular fall in the *level* of mortality were fundamental shifts in the *pattern* of mortality. This paper reviews the past history of mortality transition and discusses future prospects of human longevity.

The history of mankind witnessed three major transitions of mortality pattern. First, an increasing amount of evidence suggests that the shift in the major means of survival from hunting and gathering to agriculture, which occurred in many regions of the world thousands of years ago, raised the level of mortality from infectious and parasitic diseases. Some characteristics of agricultural societies (including the increased population density, extended residence at the same locations, storage of foods, and domestication of some animals) made it easier for various pathogens to diffuse effectively in human populations. Second, the development of industrialized economies in the nineteenth and twentieth centuries was accompanied by considerable declines of mortality from infectious and parasitic diseases as well as maternal, perinatal, and nutritional disorders. Death rates among infants, children, and young adults were markedly reduced. The rise in the standard of living (in particular, nutritional status), improved public health measures, and progress in medical technology were among major causes of the mortality decline. Lastly, during the third quarter of the twentieth century, significant declines of mortality from degenerative diseases (in particular, cardiovascular diseases) started in many economically developed countries. The reduction of death rates at old ages was substantial.

Two more fundamental changes in the pattern of human mortality will possibly occur during the twenty-first century: notable reduction of cancer mortality, which may have already started in the 1990's, and slowing of senescence. Cutting-edge biomedical research is now unveiling mechanisms of cancer development and aging processes. The progress in basic understanding of those mechanisms may lead to new medical technologies.

The future prospect of human longevity, however, is not unconditionally positive. Humans are facing some serious risks of mortality increase. First, a number of new infectious diseases, most notably AIDS, are emerging, and some old infectious diseases that were once considered to have been brought under control are re-emerging. Infectious diseases can spread over the world more quickly than before, due to the increased, faster, and wider range of transportation. After many drugs that effectively control pathogens of major infectious diseases were developed and used widely, new strains of pathogens that are resistant to those drugs have evolved. Second, pollutants from industry, agriculture, transportation, and household activities contaminate air, water, and soil, and accumulate in edible animals and plants. Although significant mortality impacts of pollution have so far been limited to certain areas and occupations, they may soon become noticeable at the national level if the long-term accumulation of environmental contamination exceeds some threshold. Third, technological progress and economic development make it easier for many

countries, including ideologically extreme countries and politically unstable countries, to obtain or develop nuclear, biological, and chemical weapons. These means of mass destruction may spread further to terrorist groups, criminal organizations, and mentally disturbed individuals. Lastly, an increasing amount of direct and indirect evidence indicates that people's feelings about the meaningfulness and worthiness of their lives have significant impacts upon their health and survival. High death rates (even after exclusion of external injuries and AIDS) are observed in urban slums of some affluent countries, socio-economic differentials in health and survival remain substantial even in countries with strong welfare policies and programs, and the mortality decline stagnated (and, in some cases, was reversed) in a number of countries of Eastern Europe and the former Soviet Union during the last three decades. These seem to suggest, though indirectly, that social disorganization and alienation could place serious obstacles to further improvement of health and survival.