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MORTALITY DIFFERENTIALS, BY SEX

Sex differences in mortality have varied in different countries, historical periods, and age groups (see Figure 1). During the last quarter of the twentieth century, males had higher mortality than females at all ages in all developed countries and in most less developed countries. However, higher mortality for females was relatively common among young children in less developed countries. During the mid-twentieth century, females also had higher mortality among older children, teenagers, and/or young adults in some less developed countries, particularly in South Asia.

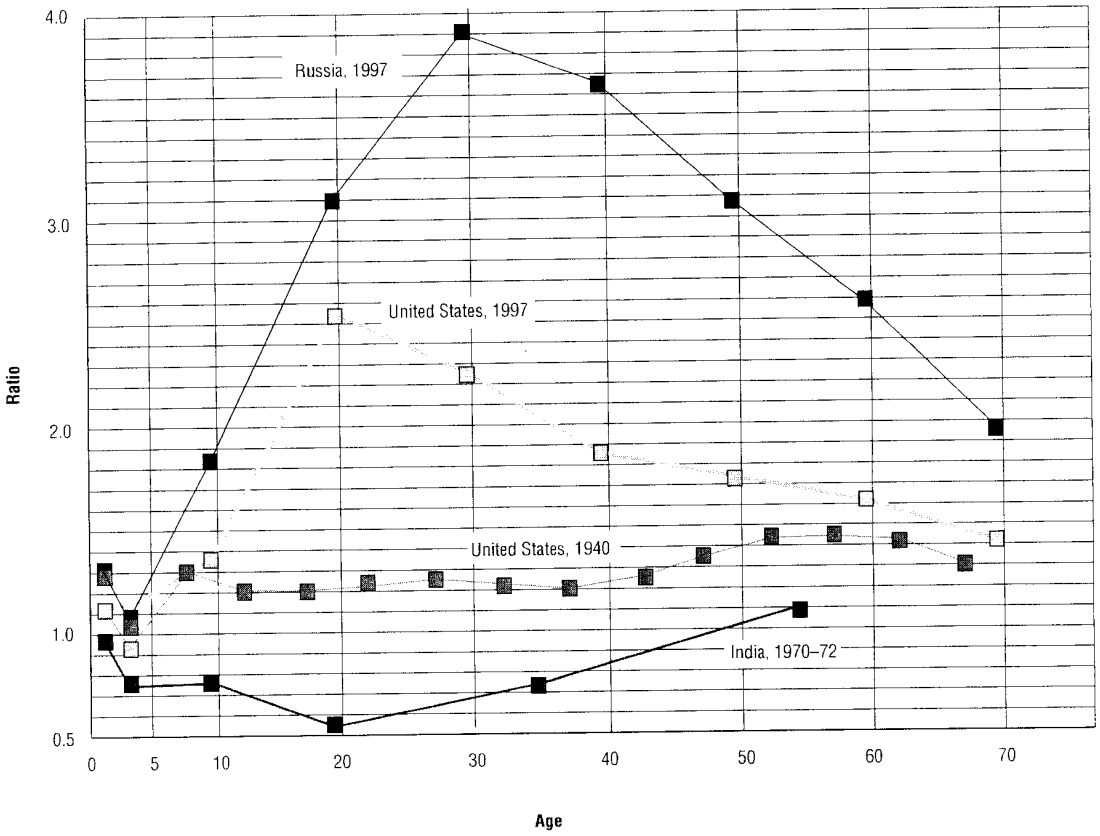
Because males generally had higher mortality than females, males had shorter life expectancies than females in most countries during the period 1950–2000. During the late 1990s, male life expectancy at birth was shorter than female life expectancy by approximately eight years in Europe, six years in North America, seven years in Latin America and the Caribbean, three years in Asia, and two years in Africa. Sex differences in life expectancy varied for different countries within each continent. Probably the largest recorded male disadvantage was in Russia during the late 1990s, when male life expectancy was more than twelve years shorter than female life expectancy. In contrast, males had longer life expectancies than females in some South Asian countries during the mid-twentieth century. For example, in India in the period 1950–1975 male life expectancy was one to two years longer than female life expectancy.

Causes of Death

Major contributors to higher male mortality include coronary heart disease (also known as ischemic heart disease) and injuries, suicide, and homicide (known collectively as external causes of death). For coronary heart disease and for the external causes of

FIGURE 1

Ratio of Male Death Rates to Female Death Rates by Age: Russia, United States, and India, Selected Years



SOURCE: Lopez and Ruzicka (1983); World Health Organization (2002); U.S. Department of Commerce, Bureau of the Census. *Vital Statistics of the United States, 1940, Part 1*. Washington DC: United States Government Printing Office, 1943.

death, males have had higher mortality than females at all ages in all or almost all countries and time periods. Often male death rates have exceeded female death rates by 100 to 300 percent for these causes of death.

Sex differences in cancer mortality and infectious diseases mortality have varied, depending on the specific type of cancer or infectious disease as well as the age range, country, and time period considered. For example, males have had higher lung cancer mortality, but females have much higher breast cancer mortality. Males have often had higher infectious disease mortality than females, particularly in developed countries and among infants and older adults. However, females have had higher infectious disease mortality for children and/or young adults in some less developed countries.

Variation in sex differences in total mortality has been due to variation in the sex differences for specific causes of death and variation in the relative importance of the different causes of death. For example, higher total mortality for females has been observed most often among children and young adults in less developed countries where infectious disease mortality is more likely to show a female excess and where infectious diseases and maternal mortality make substantial contributions to total mortality. In contrast, these causes of death are less important in developed countries where the dominance of external causes of death, coronary heart disease, and lung cancer in total mortality results in

males having consistently higher total mortality than females.

Biological, Behavioral, and Environmental Causes

Sex differences in mortality have been influenced by the interacting effects of multiple biological and environmental factors, including the effects of sex hormones on physiology and behavior, as well as cultural and social influences on sex differences in behavior and access to health-promoting resources. The following paragraphs illustrate the diversity of causal factors that have influenced sex differences in mortality for different causes of death.

Males' higher mortality for accidents, suicide, and homicide has been due primarily to a variety of sex differences in behavior and life roles, including males' higher rates of gun use, heavy drinking, physical risk taking in recreation, employment in physically hazardous occupations, and speeding and other risky driving practices. These behaviors have been more expected and accepted for males, and cultural and social influences on sex differences in behavior have contributed to males' higher mortality for the external causes of death. In addition, males' brains are exposed to higher testosterone levels in utero as well as after birth, and this may predispose males to more vigorous physical activity and physical aggressiveness, which contribute to males' higher mortality for the external causes of death.

The consistent male excess in coronary heart disease mortality appears to be due in large part to biological sex differences, including males' greater propensity to accumulate abdominal fat and the apparently protective effects of females' natural sex hormones. These biological effects have been reinforced by males' greater risk as a result of higher rates of tobacco use, especially cigarette smoking, in most countries and time periods.

Sex differences in cigarette smoking have been the main cause of sex differences in lung cancer mortality. In many developed countries in the twentieth century sex differences in smoking increased initially as males adopted cigarette smoking earlier and in greater numbers than did females; subsequently, sex differences in smoking decreased as female smoking became more common and male smoking rates decreased. These trends in sex differences in smoking have been followed by corresponding initial increases and subsequent decreases in sex differences in lung cancer mortality. The delay between the trends in smoking and lung cancer is explained by the substantial lag between initial smoking adoption and the consequent lung cancer mortality.

Sex differences in mortality resulting from infectious diseases have been influenced by multiple and sometimes counteracting biological and environmental factors. Hormonal and genetic effects appear to contribute to lower immune function and greater vulnerability to infectious diseases among males. However, in some regions, especially in South Asia, girls may receive less medical care for infectious diseases, and this may increase their risk of infectious disease mortality. The factors that influence sex differences in infectious disease mortality vary for different types of infectious diseases. For HIV/AIDS, biological sex differences result in a greater female risk of infection as a consequence of heterosexual intercourse with an infected partner, but a greater male risk of infection as a consequence of homosexual contacts. In addition, in many societies males have greater exposure to HIV infection because of greater use of intravenous drugs and multiple sexual partners. Thus, both biological factors and culturally influenced behavioral differences influence sex differences in HIV/AIDS infection and mortality rates.

Trends

Historical data for economically developed countries that are economically developed at the beginning of the twenty-first century show that sex differences in mortality have varied substantially in magnitude and have even reversed direction in some cases in which higher mortality for females during earlier periods was subsequently replaced by higher mortality for males. Higher mortality for females was relatively common among children, teenagers, and/or young adults during the late-nineteenth and/or early-twentieth century. Contributing causes appear to have included higher infectious disease mortality for females and maternal mortality. By the mid-twentieth century these causes of death had become less important and females' status and life circumstances had improved, and so females had lower total mortality than males did at all ages.

By the late-twentieth century in economically developed countries, external causes of death became the largest contributor to total mortality for

teenagers and young adults, so in this age range males had much higher mortality than females. The male mortality disadvantage also increased among older adults during the mid-twentieth century, partly as a result of the delayed harmful effects of males' early and widespread adoption of cigarette smoking. As a result of all of these mortality trends, the male disadvantage in life expectancy increased from approximately zero to four years around 1900 to approximately five to nine years in the late 1970s.

During the last few decades of the twentieth century, sex differences in mortality showed contrasting trends in different developed countries. The male mortality disadvantage began to decrease in the United States and some Western European countries, but it increased substantially in Russia and some other Eastern European countries. The increasing male mortality disadvantage in Russia was due primarily to increasing male death rates for external causes of death and cardiovascular diseases, apparently partly as a result of increased binge drinking and other harmful effects of the substantial social and economic disruptions during this period.

In light of the many different interacting factors that influence sex differences in mortality and the difficulty of predicting future trends in many of those factors, it is not surprising that there is a wide range of predictions concerning future trends in sex differences in life expectancy. For example, for developed countries different researchers have predicted increasing or decreasing sex differences in life expectancy during the early decades of the twenty-first century. For Asia and Africa there appears to be a more general agreement that sex differences in life expectancy will show a growing female advantage during the early-twenty-first century, repeating the experience of developed countries during the mid-twentieth century. However, uncertainty concerning future trends in the HIV/AIDS epidemic contributes to uncertainty concerning future trends in sex differences in life expectancy in Asia and Africa.

See also: *Biology, Population; Causes of Death; Infant and Child Mortality; Sex Ratio; Tobacco-Related Mortality.*

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MORTALITY DIFFERENTIALS, SOCIOECONOMIC

Research on differential mortality generates answers to questions such as the following: To what extent are there within-country differences in mortality between subpopulations defined by area of residence, socioeconomic status, marital status, and other variables? What are the causes of such differences? How and why does the extent of the differences change in time and vary between countries?

The answers to these questions are important from a social and health policy perspective because