



Introduction

“Legislation will not make the mortality rates of males and females equal, any more than the proposed legislation by the Indiana State Legislature in 1897 that the value of π was 4 made it so; instead it just made the legislators look foolish” (Wilkie 1984; Eves 1964).

“The [insurance] industry seems to be “hooked on” sex segregated mortality tables only because historically sex has been used as a longevity factor” (Marshall 1984).

Physicians, epidemiologists, biologists, demographers, actuaries, and laymen have long been aware of lower mortality rates among females compared with males in every age group (Price 1772); however, outside of academic journals in the health sciences or demography areas, little has been written regarding the causes of the differential.

The fact that women live longer than men is often noted in the popular press, but rarely are the causes of the sex mortality differential discussed. An article in *Reader's Digest* (Rosenfeld 1972) described how the male's higher metabolic rate and greater susceptibility to diseases, particularly genetic diseases, gave the male an inborn weakness. Rosenfeld stated that the male sex role added to the biological disadvantage in that males drink more alcohol, smoke more, are more emotionally disturbed (as demonstrated in higher suicide rates for males than for females), and react to stressful situations with greater anxiety and insecurity.

Goldberg (1993), a urologist, in his book *How Men Can Live as Long as Women: Seven Steps to a Longer and Better Life*, states many ways men can improve their health and longevity by changing their behavior. Implying that behavior is the only reason men die younger, he states: *“There's no biological law that says men must die earlier than women. Medical science has failed to find any reason why testosterone or a penis and testicles should cause us to fold early in*

the game. All the evidence says the problem isn't in the cards we're dealt; it's how we play them. It's how we live our lives that's causing us to die.”

Cröse (1997), a gerontologist, wrote a book describing some of the genetic and hormonal hypotheses of the sex mortality differential, but her primary thesis was to encourage men to take better care of themselves.

Opinions regarding the causes of the sex mortality differential are often not supported by evidence and even appear to vary by sex. A study of college students showed that men attribute the differential to greater physical labor of men and the less stressful life of women (40% of the men gave one of these explanations first). However, women believe that they take better care of their health (31% of the women listed this explanation first). The explanations with the most evidence as demonstrated in this paper, that biologic/genetic factors favor women and that men take more risks and engage in riskier habits, were cited as the first explanation by 16% and 24% of the men, and 14% and 21% of the women, respectively (Wallace 1996).

Sex distinct mortality tables have been the subject of U.S. lawsuits that have reached as high as the Supreme Court (Marshall 1984). The causes of the differences in mortality by sex have even been argued in the legal community (Kimball 1979, 1980; Brilmayer et al. 1980).

Actuaries have been interested in the causes of the difference in mortality between the sexes at least since 1947 (W. Perks' comments on Pedoe 1947; Starke's comments on Martin 1951). In the actuarial literature, Bowerman (1950) noted that the decrease in mortality and the increase in the sex mortality differential during the first half of the 20th century

have paralleled five events in particular: (1) a vast decline in deaths from tuberculosis and the infectious and parasitic diseases, (2) an increased urbanization of the people, (3) a contin-

ued decrease in the size of the family, (4) a marked increase in the use of machinery in commerce, industry and the home and (5) freer dress and more athletic life of women. . .The transformation has probably been more complete in the home than in either office, factory, mine or transportation. The washing machine, vacuum cleaner, waxer, sewing machine and several other conveniences have replaced many fatiguing and often "back-breaking" jobs of a generation earlier. Women have perhaps adapted themselves better than have men to the atomization, rationalization and artificialities of modern life. The disappearance of the whalebone corsets and the appearance of women in light athletics have no doubt had an influence favorable to the longevity of women.

In reviewing sex mortality differentials by age and cause of death, the Committee on Ordinary Insurance and Annuities (1974) stated: "These findings, especially with regard to mortality from heart disease, strongly suggest that sex differentials in mortality are due to biological as well as environmental factors and that the relative importance of the biological component varies by sex and social circumstances." Lautzenheiser (1976) noted that (1) sex mortality differentials are almost universal, (2) the sex mortality differential is greater among those working outside the home, and (3) there is evidence that biological factors contribute to the difference. Berin et al. (1990) discussed historical trends in the sex mortality differential, future projections, and social, political, and economic implications of the differential.

Leonie Tickle (1997), an Australian actuary, discussed the sex mortality differential and its causes in a 1997 research paper. This paper dealt extensively with five main causes of death groups and primarily concentrated on mortality in Australia.

Evidence exists for both biological and social causes of the sex mortality differential, but existing literature on the subject tends to emphasize only one or the other. As Nathanson (1984) stated:

" . . .investigators' disciplinary orientations are reflected in their specification of what is to be explained—e.g., the biologically oriented scholar emphasizes the invariant nature of sex mortality differentials, while the social scientist focuses on variation in their magnitude over time and under different circumstances—in their choice of potential explanatory variables, and in the methodologies they employ. It is the uniquely protean [variable] quality of sex as a conceptual category

that allows the scholar to see in it that for which his training tells him to look: the biologist sees hormones; the epidemiologist, risk factors; and the sociologist, social roles and structural constraints (Nathanson 1984).

To the author's knowledge, with the possible exception of Tickle (1997), no comprehensive review of what is known about the causes of the sex mortality differential has been written for the actuarial or lay audience. This paper attempts to fill that void. Although other writings briefly discuss the history of sex mortality differentials, this is the first thorough review of the literature explicitly addressing this history, particularly prior to modern times. This paper intends to present a balanced presentation of evidence, both biological and social, regarding the reasons for this differential for the non-academic audience. In this enterprise, the writer concurs with Richard Price who, in 1772, analyzed reversionary annuity schemes:

Finding, therefore, that the public wanted information on the subject, I was led to undertake this work; imagining that it might be soon finished, and that all I could say might be brought into a very narrow compass. But in this I have been much mistaken. A design, which I at first thought would give little trouble, has carried me far into a very wide field of enquiry; and engaged me in many calculations that have taken up much time and labor.

The author's original intent in writing this paper was to quantitatively and definitively decompose the sex mortality differential into its causes. After much research and reflection, it became evident that with the current level of knowledge this is not possible. At best we can determine some of the causes and generally estimate how much each contributes to the differential.

The sex mortality differential has not always been taken seriously:

For several years one of the authors [Wilson T. Sowder, M.D.] has been calling attention, by articles and other means, to the striking increase in the difference between the mortality rates of males and females in recent decades. Some interest has been shown in the subject, although there have been other reactions which have ranged from indifference to levity and from skepticism to the amused toleration received by a person who is normal in all respects except one. Talks on the subject have been publicized as humorous and the facts presented have been discounted with the charitable attitude that

exaggeration is permissible when the subject is not important, and serious acceptance not expected. (Sowder and Bond 1956).

To accurately understand the causes of the sex mortality differential, it is important first to gain some background knowledge. This monograph begins with a summary of the typical methods used in measuring the sex mortality differential. It then reviews the history of the sex mortality differential — both the his-

tory of the differential itself and a historical survey of its analysis. To obtain a better understanding of the differential, the monograph next examines it in different ways—by region, by age group and by cause of death. With this background, the various hypotheses regarding the causes of the sex mortality differential are analyzed in detail. The monograph concludes with an examination of expert opinion regarding the future of the differential.

