

Chapter 7

Surface Plots of Rates of Mortality Improvement for Selected Causes of Death in the United States

The current chapter shows how surface maps of rates of mortality improvement can also be used to analyze causes of death. This might enable researchers to gain better insights into the underlying mortality dynamics than merely looking at the Lexis surface of rates of improvement for all-cause mortality. We selected the United States for two reasons:

- Data on deaths are available as public use files since 1959 (National Center for Health Statistics 1959–2015; National Bureau of Economic Research 1959–2015). Information is included not only on age at death and sex of each deceased individual but also on cause of death and many other variables. See Chap. 3, starting on page 11, for further details about the more than 118 mio. deaths contained in the data.
- The pattern of the rates of mortality improvement for women in the United States looked different than in any of the other countries (see Fig. 6.21 on page 65). Since the late 1970s/early 1980s, the US has not experienced any prolonged period of survival improvements. Indeed, the United States gained less years of life than most other western countries during the latter part of the twentieth century. As a consequence the National Institute on Aging in the United States “requested that the National Research Council (NRC) launch a major investigation to clarify patterns in the levels and trends in international differences in life expectancy above age 50” (Crimmins et al. 2011, p. 2).

We used again the same techniques and color schemes as in Chap. 6. To avoid any spurious conclusions due to small numbers of deaths, we excluded deaths above age 95 and below age 20.

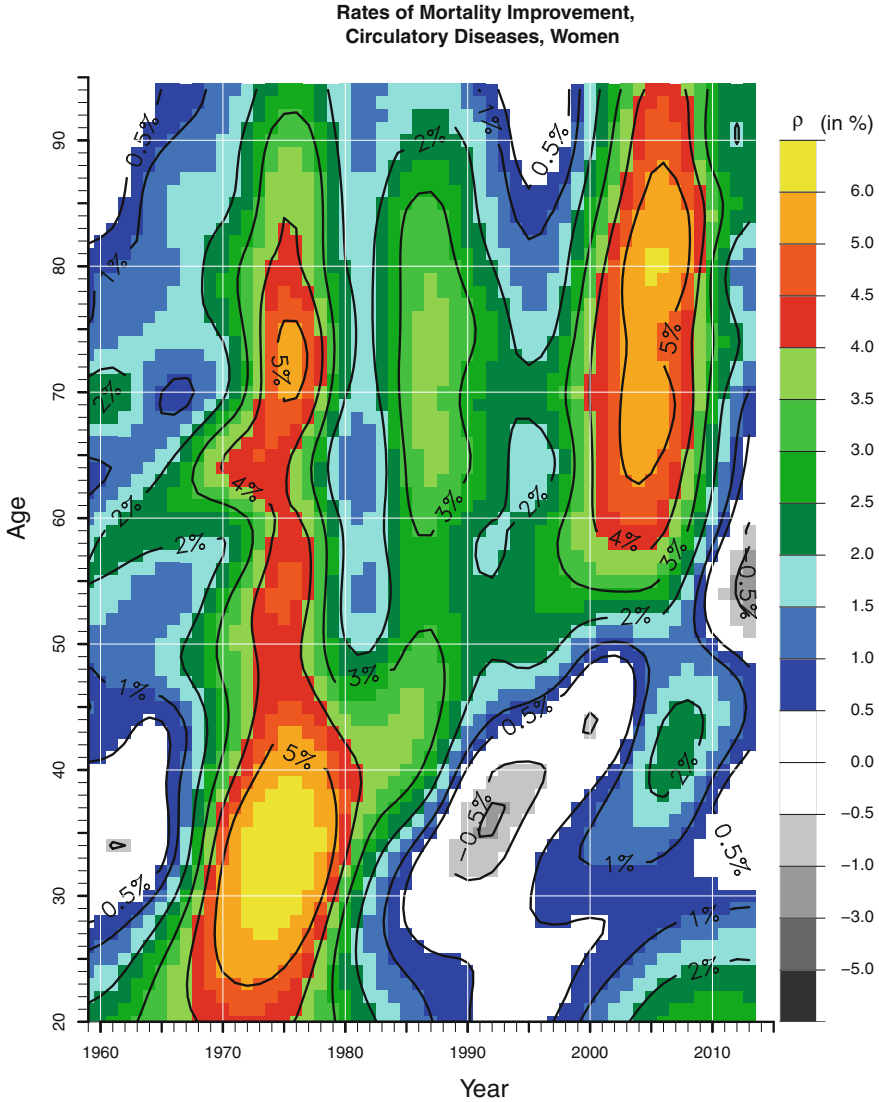


Fig. 7.1 Rates of mortality improvement for all circulatory diseases for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

More than 50 mio. deaths—corresponding to almost 45% of all deaths—can be attributed to diseases of the circulatory system. The ROMI plot for mortality due to these causes is depicted in Fig. 7.1. Heart diseases (Fig. 7.2), e.g., myocardial infarction, and cerebrovascular diseases (Fig. 7.3) such as stroke constitute about

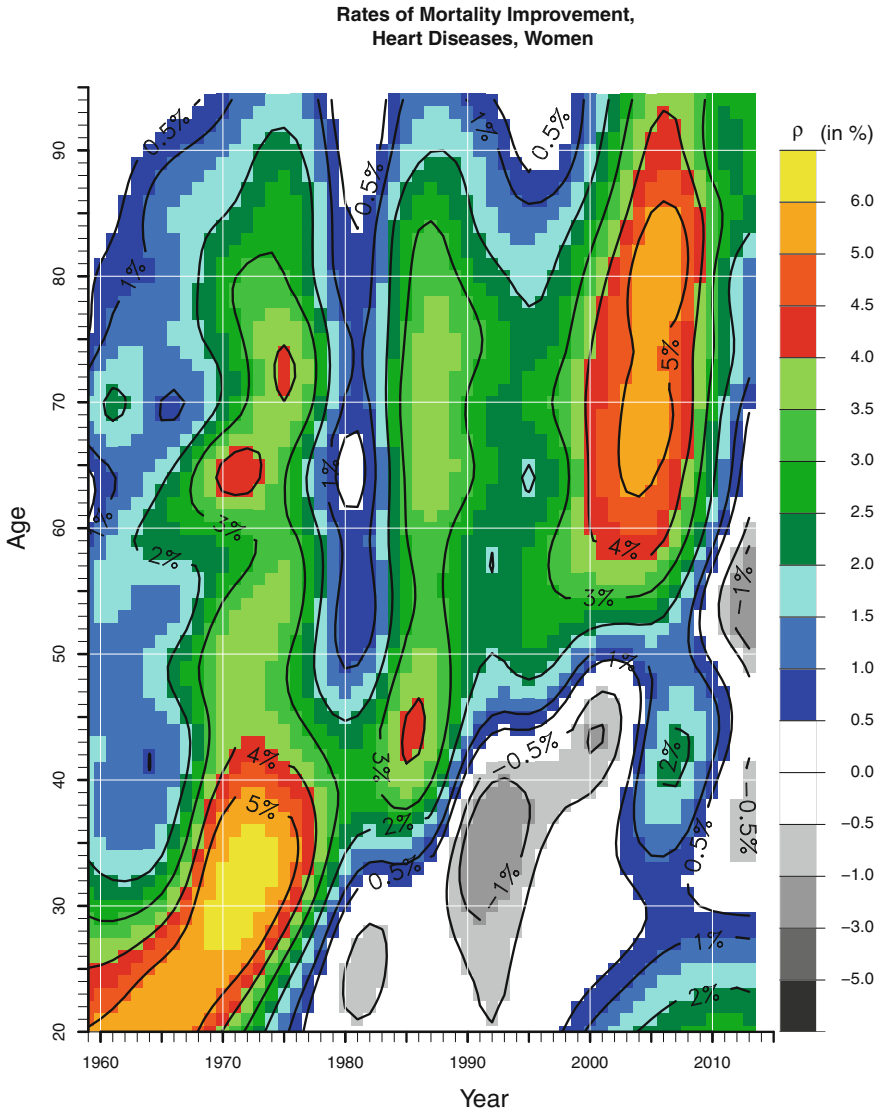


Fig. 7.2 Rates of mortality improvement for heart diseases for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

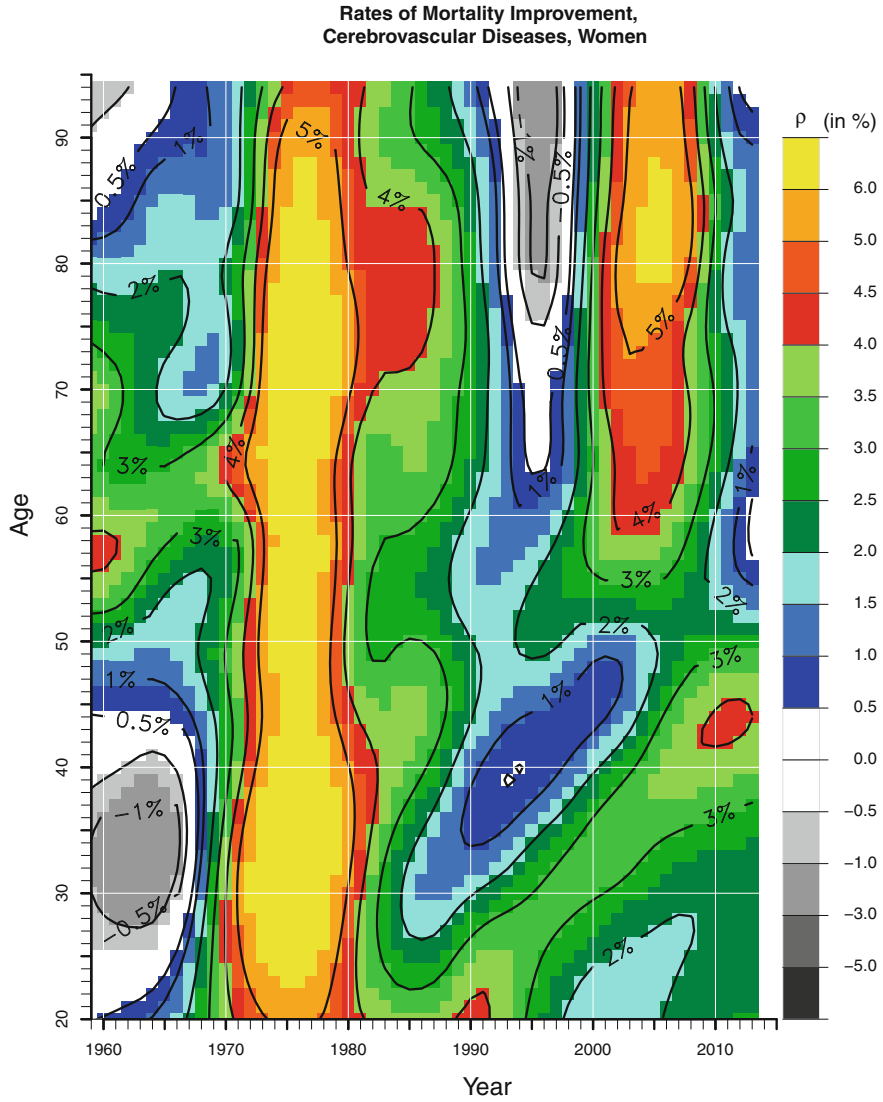


Fig. 7.3 Rates of mortality improvement for cerebrovascular diseases for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

95% of all deaths from circulatory diseases. We can draw at least two conclusions from those figures:

- Circulatory diseases can not be the reason why (female) life expectancy in the United States barely increased during the last two decades of the twentieth century. We see major annual declines (three percent and more) in mortality due to these causes.
- The pattern found for mortality from heart diseases and cerebrovascular diseases as well as from the composite picture of all circulatory diseases resembles the pattern we found in Chap. 6 for rates of mortality improvement from all causes in many countries such as Spain, Japan, or Italy. At that time we were only able to speculate that the “cardiovascular revolution” was the primary reason for the observed pattern. While Figs. 7.1, 7.2, and 7.3 are no definite proof, we can feel more certain about our suggestions.

So if circulatory diseases were the main reason for life expectancy gains in many European countries during the 1980s and 1990s, why did life expectancy in the United States not increase in a similar manner since mortality from heart diseases, stroke and similar causes also declined remarkably in the US?

If circulatory diseases can be excluded, we turned our attention to malignant neoplasms (“cancers”). They are responsible for more than one in five deaths. Among the various cancer sites, we decided to look at three major sub-categories: colorectal, breast and lung cancer (Figs. 7.5, 7.6, 7.7, and 7.8) in addition to mortality from all cancers (Fig. 7.4).

Deaths from any kind of cancer for women (Fig. 7.4) show a mixed pattern: Below age 50 we can detect a continuous trend of improving survival conditions throughout most of our observation period. Lower mortality from cancer extends also to higher and higher ages after the mid-1980s (Fig. 7.4). Those survival improvements that show some characteristics of a cohort effect could be influenced by declining mortality from colorectal cancers as suggested by Fig. 7.5. Also breast cancer (Fig. 7.6) displays steady improvements albeit starting only in the 1990s. The main cause for the poor development of female life expectancy during the late twentieth century is probably lung cancer. Among the authors of this book, Fig. 7.7 on page 77 is the strongest cohort effect they have encountered when analyzing rates of mortality improvement by cause of death. Also men (Fig. 7.8, p. 78) feature such a strong cohort effect. The pattern for males is located further left on the Lexis map, i.e., earlier in calendar time, supporting the idea of the “cigarette diffusion” explanation [...] that convergence in male and female smoking is the byproduct of a female lag in the process of cigarette adoption, diffusion, and abatement” (e.g., Pampel 2001, p. 388). Furthermore, our figures on lung cancer, in conjunction with the detrimental effects shown in Fig. 7.9 for respiratory diseases, are in line with

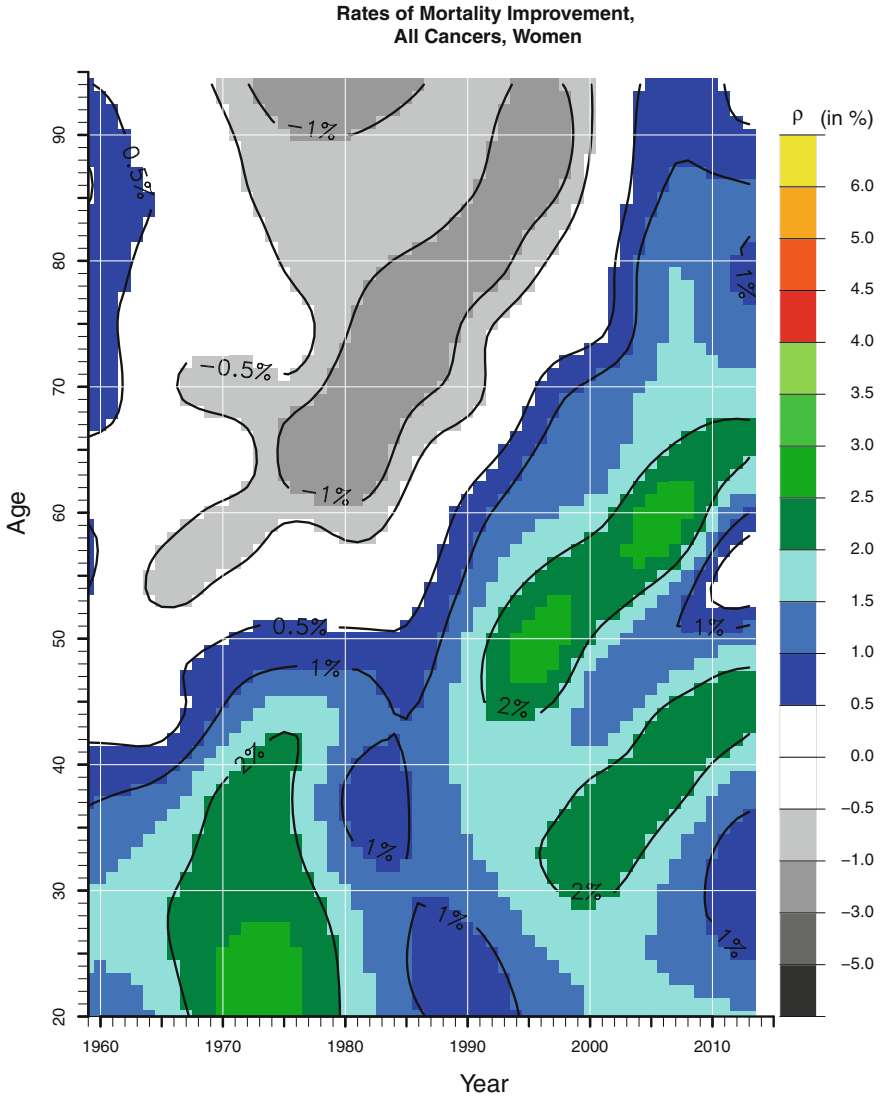


Fig. 7.4 Rates of mortality improvement for malignant neoplasms for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

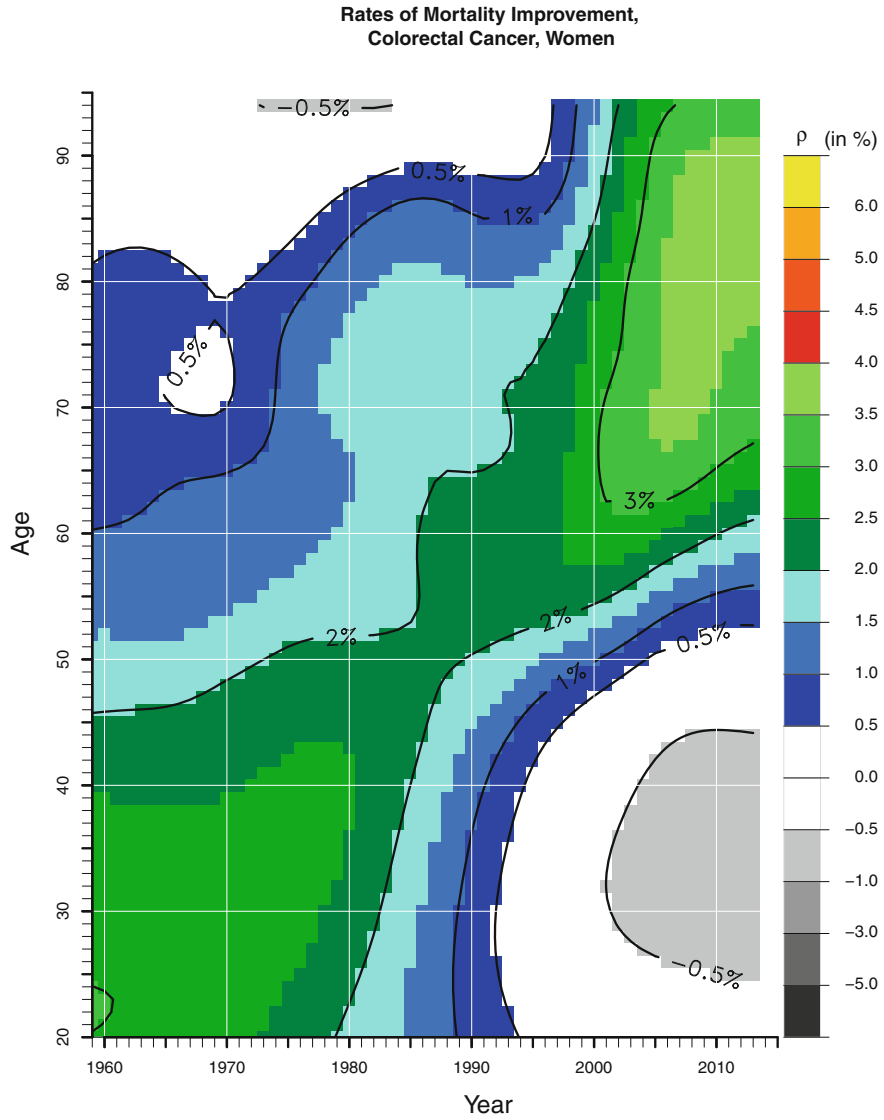


Fig. 7.5 Rates of mortality improvement for colorectal cancer for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

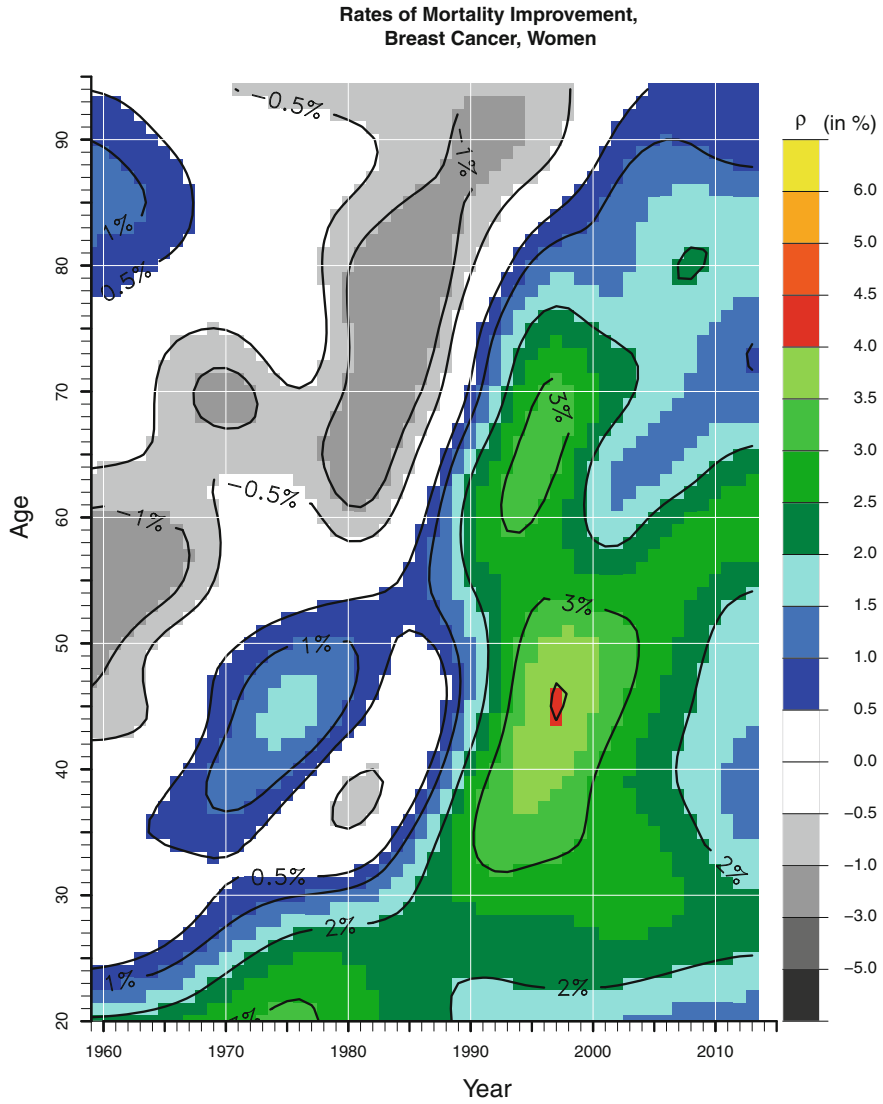


Fig. 7.6 Rates of mortality improvement for breast cancer for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

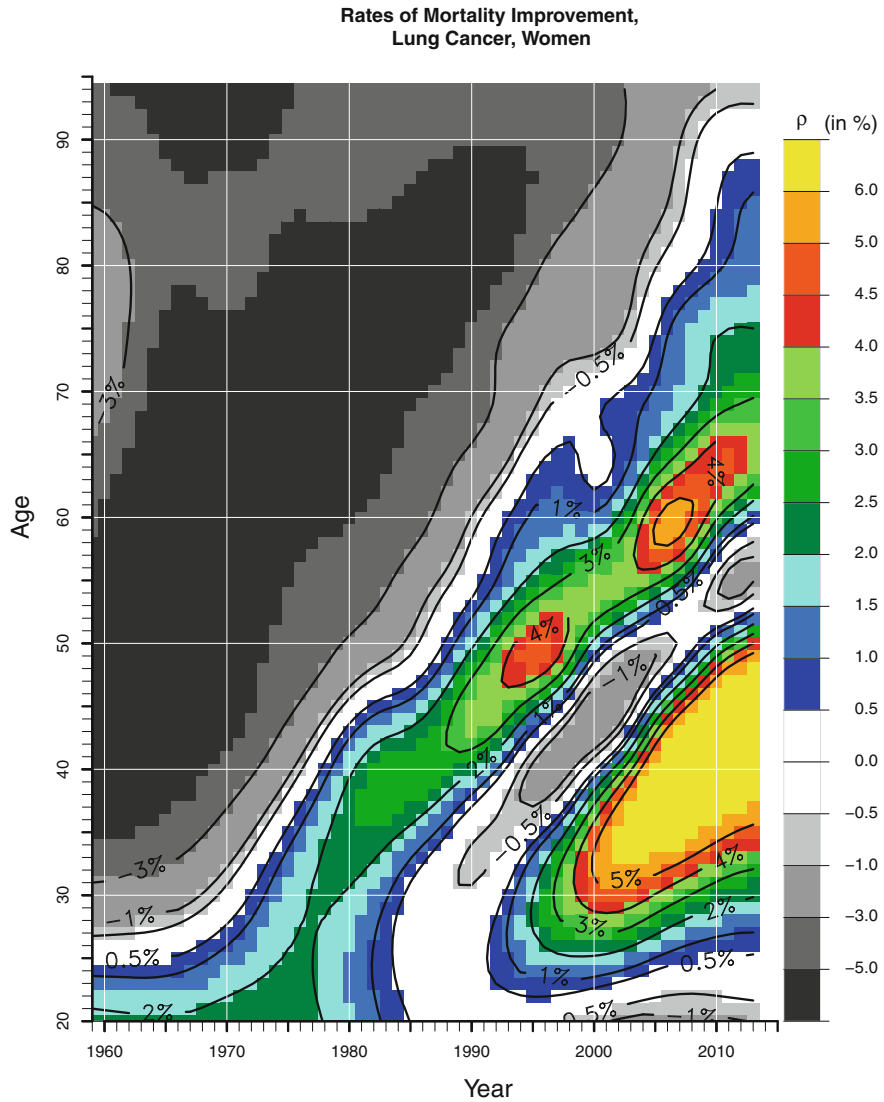


Fig. 7.7 Rates of mortality improvement for lung cancer for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

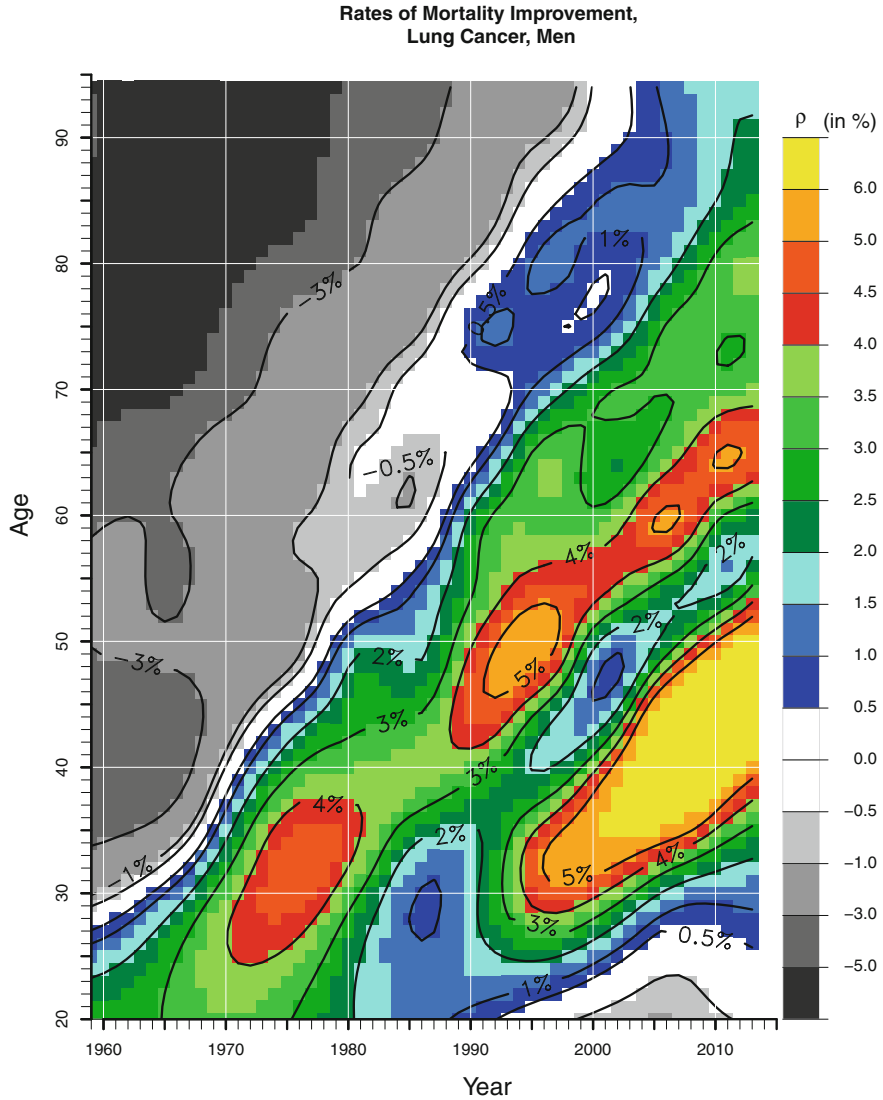


Fig. 7.8 Rates of mortality improvement for lung cancer for men in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

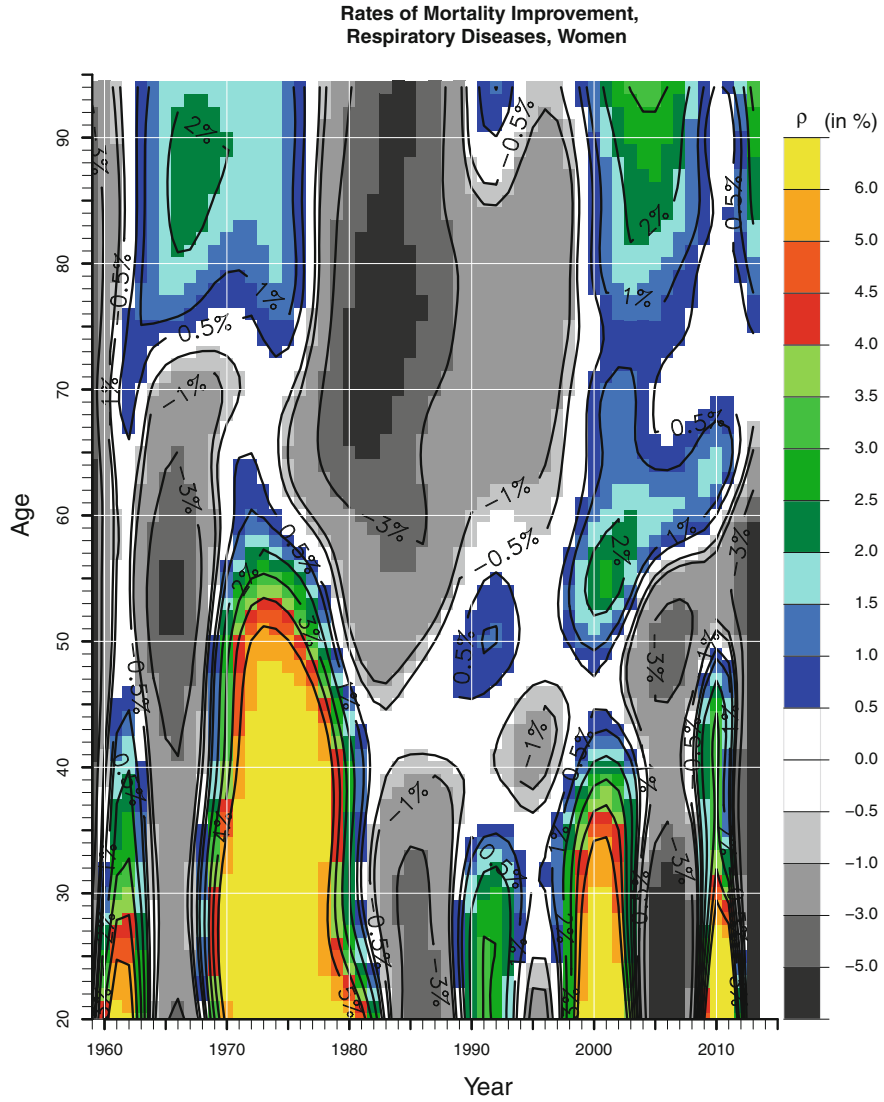


Fig. 7.9 Rates of mortality improvement for respiratory diseases for women in the United States aged 20–95 between 1959 and 2013 (Data source: Human Mortality Database, National Center for Health Statistics, and National Bureau of Economic Research)

Wang and Preston (2009, p. 398) who argue that “[b]ecause of changes in smoking behavior that have already occurred or that can be reliably projected, American mortality is likely to fall more rapidly than is commonly anticipated.”

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