

Age and Time Patterns of Mortality by Cause in Italy: A Mortality Surface Approach

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1. Introduction

According to the theory of the epidemiological transition, all industrialised countries experience three phases in the process of modernisation. The three phases are acknowledged (Omran, 1971) as the "age of pestilence and famine", during which mortality is high and fluctuating, with an average life expectancy under 30 years; the "age of receding pandemics", during which life expectancy rises considerably, from under 30 to over 50; and the "age of degenerative and man-made diseases", during which the pace of the mortality decrease slackens, while the disappearance of infectious diseases increases the visibility of degenerative diseases and man-made diseases become more and more frequent. During the 1980s, continuing improvements in survival, notably at older ages, prompted the suggestion of a "fourth stage" (Olshansky and Ault, 1986). The new era was characterised by a shift towards older ages at death from degenerative diseases and a decline in mortality from these diseases, because of early diagnosis and more efficient treatments.

In Italy, the epidemiological transition follows the described stages although, until the beginning of the XX century, the country experienced a delay with respect to other Northern European countries, in particular with respect to Sweden, Norway and England.

The aim of the paper is to study trends and differentials in cause-specific mortality, in Italy, during the last century, exploiting a new simple but powerful tool: the surface by age and time of leading causes of death. First, considering the Italian mortality data by age and sex for large groups of causes of death, we review the epidemiological transition in Italy through the mortality surfaces of the first and second leading cause of death from 1895 to 2000. Second, focusing on the last stage of the epidemiological transition, we analyse the new mortality profiles through the surfaces of the first and second leading cause of death with respect to cancer and cardiovascular diseases from 1969 to 2000.

2. Trends and Differentials in Mortality in Italy: 1887-1994

Figure 1 depicts the surface of age-specific death probabilities of Italian men and women over the period from 1887 to 1994. The figure portrays over a century's mortality in Italy for both men and women. The shading goes from dark to light as the surface rises from low to high mortality. The effects of the two World Wars are easily traced on the maps by the elongated rays of high mortality crossing all ages. For men, these effects linger on for some years after the wars among the cohorts that were born or grew up during the war years. As it is clear from the figure, the rapid decline in infant and teenage mortality in the first part of the 1900s stands in marked contrast with the marginal gains made at later ages. Nor did the situation visibly improve for adult men for some time: hardly any change is registered before World War II. It was not until later, and only for the younger adults, that the process of contraction began, becoming generalized up until the age of 40 between the 1950s and the 1960s. The very slow decline of male mortality contrasts sharply with what women were experiencing during the same period. Although men and women shared a similar mortality risk at the outset, Italian women experienced a steady reduction in mortality and began to enjoy a considerable advantage over men. Even after age 40, mortality trends differed by sex, yet

again to the advantage of women. Until the 1970s, male mortality rates hardly changed, especially at ages above 60, so much so that it was thought that a maximum had been reached beyond which it was impossible to go. This pessimistic outlook was clearly undermined by the trends in female mortality rates that, despite their steady decline from the beginning of the century, showed no sign of slowing down. From the mid-1970s, a new phase took off and mortality rates started declining for all ages, even for the elderly, although at a slower pace for men than for women.

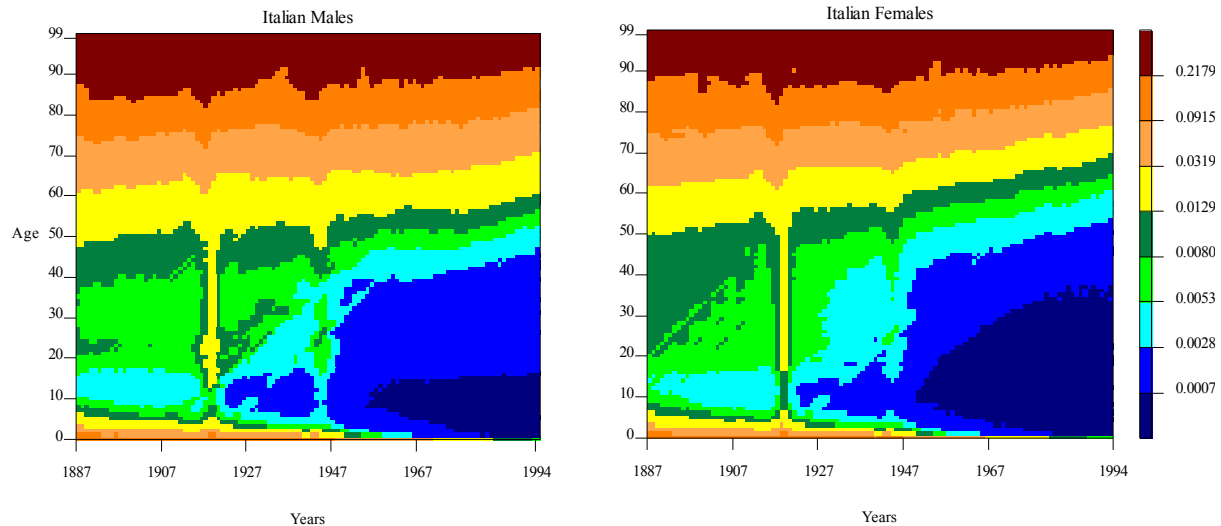


Figure 1. Probability of dying for Italian men and women from 1887 to 1994.

A better understanding of the mortality transition and the differences in gender mortality trends are possible by looking at the patterns of cause-specific mortality by age. Mortality surfaces, which give a unique panoramic view of mortality dynamics over age and time, can be advantageously used also to represent the epidemiological transition. Italy offers perhaps the best opportunity for exploiting such a powerful tool to analyze cause-specific mortality over age and time. In fact, statistics on causes of death are available since the end of the XIX century and, as the epidemiological transition began later in Italy, all the stages of the process can be represented.

Figure 2 shows the first leading group of causes of death from 1895 to 1993 for both sexes, from birth to age 98. Accounting for the concept of “leading cause by age”, these maps can summarise the epidemiological transition through one sole graph. Although, here, causes of death are aggregated perhaps in too large groups, all the phases of the transition clearly emerge. The essential features and the gender differences in times and ways of the change from a situation in which infectious diseases predominated among causes of death to a more modern regime in which cardiovascular diseases and cancer are the most important causes of death are immediately understandable. Accidents among young, cancer and cardiovascular diseases for adults and the elderly are among the main causes of the gap that grew over the last century between the sexes. These causes are clearly linked to risk factors identified with being male – smoking, working conditions, eating habits and alcohol abuse.

3. Trends and Differentials in Mortality from Cancer: 1969-1994

By the 1960s diseases of the cardiovascular system had become the main cause of death for adults and the elderly, both in men and in women. For women, the predominant role of cardiovascular diseases very soon gives way to the influence of cancer for certain age groups. The importance of cancer progressively increases and by the mid-1980s this disease category become the leading cause of death during the middle ages of life up to the age of 70 for both women and men (figure 2).

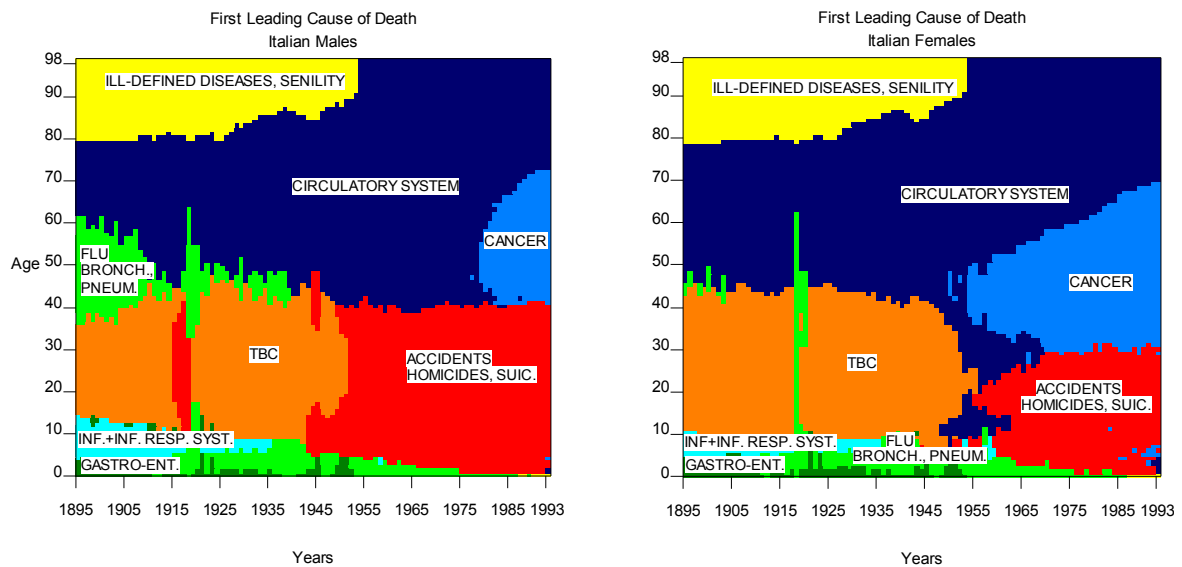


Figure 2. First leading cause of death by age for Italian men and women from 1895 to 1993.

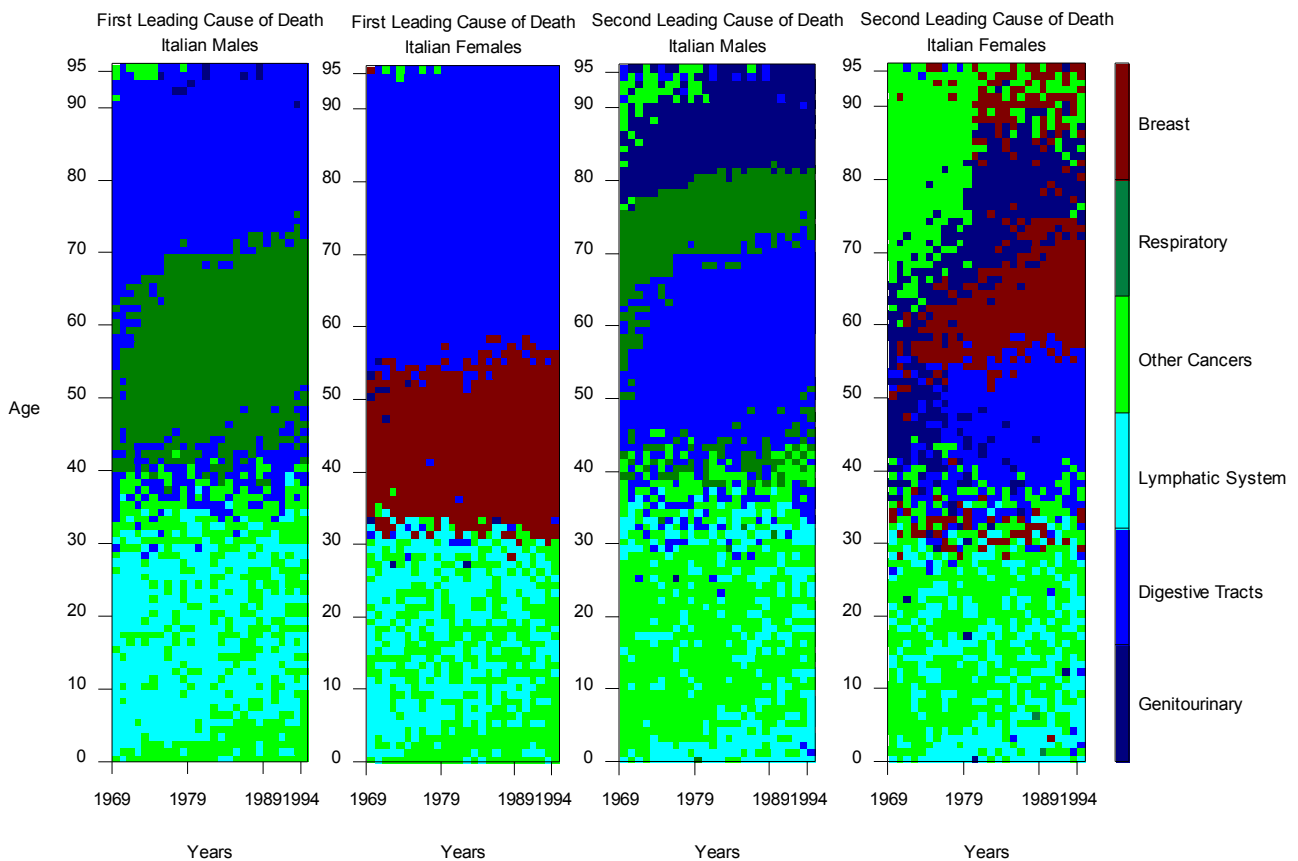


Figure 3. First and second leading cause of death among the main categories of cancer

A more in depth analysis is possible when distinguishing between the main locations of a disease category. Figure 3 shows the first and the second leading cause of death among the main categories of cancer, for men and women, from 1969 to 1994. Here malignant neoplasms have been classified into 6 categories of tumours for women and 5 for men. It shows up the predominant role of cancer of the respiratory tract for men from age 40 to 70, that of breast cancer for women from age 30 to 55, and that of cancer of the digestive tract at older ages for both sexes. It is interesting to notice that, for men, the predominance of cancer of the respiratory tract shifts over time towards older ages whereas for women the predominant category (breast cancer) concerns a larger age

range over time, including both older and a bit younger ages. Considering the second leading cause of death, the two sex-specific tumour locations continue to shift towards older ages.

For men, cancer of the respiratory tract, after an implacable resistance, entered a diminishing phase at the end of the 1970s. This positive trend is responsible for the recent decrease in male mortality due to cancer. For women, on the contrary, although values are much lower, mortality from cancer of the respiratory tract is increasing especially at old ages. This negative trend may be linked to the spread of harmful, traditionally male behaviours among women and may contribute to a possible future reduction of the mortality gap between men and women. Breast cancer also has continued to increase (especially for the elderly) until very recent years but then, by the end of 1980s, has begun to decrease and has contribute to the general reduction in female mortality due to cancer (figure 4).

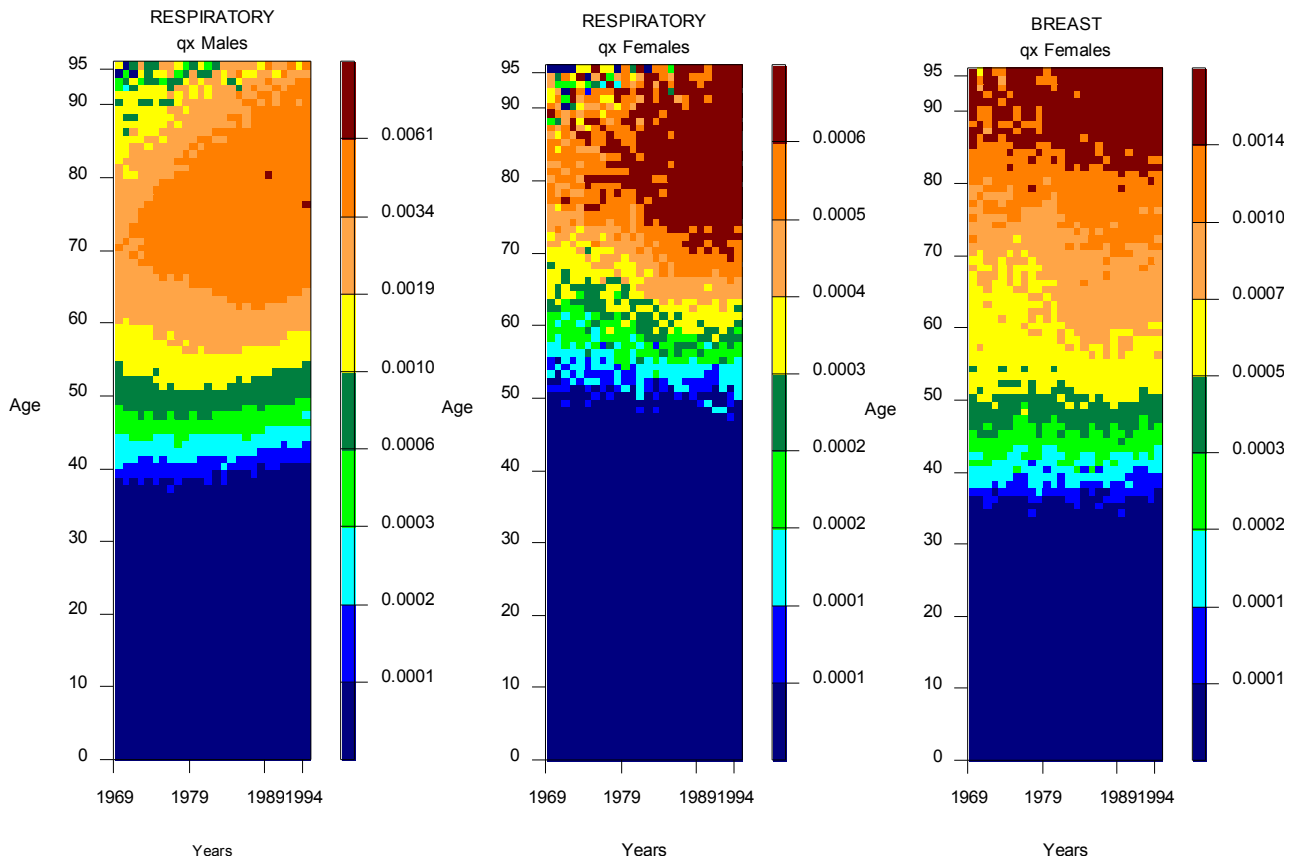


Figure 4. Evolution of mortality due to cancer of respiratory tract and to breast cancer

4. Concluding Remarks

At this stage of the research we have completed the collection of data to update to more recent years the analysis of mortality from cancer and to perform the analysis of leading causes of death also with respect to cardiovascular diseases. Different classifications of the various categories of the two groups of diseases will be also explored. Such a detailed analysis is of crucial importance for the discussion on future mortality trends: the course of these two predominant causes of death will more and more govern the overall mortality pattern and the differences between sexes and countries. In this context, the approach followed in this study seems very promising. Following the Chinese boxes-principle, it enables us to easily single out the underlying mechanisms of much more complex systems. The full and detailed picture can help then to direct the public policy towards more suitable and prompt interventions. The recent and accelerating reduction of mortality from breast cancer is a good example of the positive effects of a more widespread screening among women. In the future, for instance, mortality due to cancer of the respiratory tract in women may benefit from similar measures and come to a halt of its negative trend. As a consequence, the expected reduction of the male-female mortality gap might be negligible or not confirmed at all.