Chapter 6
Conclusion

6.1 Summary

The aim of this study was to investigate regional mortality patterns and trends at different spatial scales in Germany and to identify mortality determinants at the individual and contextual levels. The principal results of this study are briefly reviewed here. This section provides responses to each of the research questions based on the knowledge gained from the analyses in the previous chapters.

What mortality patterns can be observed at different levels of regional aggregation? With increasing life expectancy in Germany over time, how is the life expectancy increase distributed over the regions? Which regions modify the general regularities in regional patterns? Can meaningful aggregated regions with distinct mortality structures be identified?

For the most part, life expectancy in West Germany was higher than in East Germany after the 1950s. Since reunification, life expectancy has converged in East and West Germany among women, while male life expectancy in the East continues to be lower. Whereas earlier research dwelled upon the fact that East German life expectancy greatly improved, reaching the previously higher West German levels, this study looked at an extended time period and found that most of the convergence took place during the 1990s, while only a minor additional improvement in life expectancy occurred in eastern Germany in the 2000s (Chaps. 3 and 4).

Among the 16 federal states, Baden-Württemberg is clearly the state with the lowest mortality, followed by Hesse and Bavaria (life expectancy in 2004–2006 for males 78.3, 77.6, and 77.3 years, respectively; for women 83.2, 82.5, and 82.4 years, respectively). After a short period of life expectancy decline around the time of the fall of the Berlin Wall, the eastern German federal states experienced strong life expectancy increases. Of the eastern German federal states, Saxony has had the greatest success in reducing mortality. Indeed, the life expectancy among women in

E.U.B. Kibele, *Regional Mortality Differences in Germany*, Demographic Research Monographs, DOI 10.1007/978-94-007-4432-5_6,

Saxony is now higher than the nationwide average. The highest mortality is found in Mecklenburg-Western Pomerania and Saxony-Anhalt (life expectancy in 2004–2006 for males was 74.8 and 74.7 years, respectively; for women, it was 81.6 and 81.4 years, respectively).

With its high mortality profile, Saarland is an outlier in the German North-to-South gradient; while Saxony, with its low mortality in more recent years, especially among women, is an outlier in the East-to-West gradient. Saarland has significantly higher mortality than the surrounding southern German federal states. Saxony, on the other hand, has much lower mortality, especially among women, than the other eastern German federal states. While Saarland has experienced slow mortality decreases over time, mortality decreases have been strong in Saxony (Chap. 3).

The results of the mortality analysis at the small-area level (district level) show that the spatial life expectancy pattern is more diverse across the districts than across the federal states. The life expectancy increases also show greater levels of variation for the districts than for the federal states. In the mid-1990s, a large triangle of high life expectancy extended from the southwest of Bavaria over Baden-Württemberg to Hesse. Parts of northern Rhineland-Palatinate, the region of Cologne-Bonn and the northeast of North Rhine-Westphalia, and the southwest of Lower Saxony, also had high life expectancy. East German districts almost consistently exhibited low life expectancy.

The study found that spatially diverse life expectancy changes over time led to distortions in the original spatial pattern. The most prominent of these are the extraordinarily steep life expectancy increases that occurred in most East German districts. On the other hand, several districts in the most western parts of Germany experienced below-average life expectancy increases. In the 2000s, the initial life expectancy pattern partly persisted, but it was less consistent than before, especially for women. In eastern Germany, the regions of Berlin-Brandenburg, Saxony, and, to a lesser extent, southern Thuringia turned into well-performing regions. In western Germany, the Ruhr area and Saarland faced serious problems, and high mortality also persisted in northeastern Bavaria (Chap. 4).

Looking at the district level, the study clearly shows that mortality within federal states often deviates significantly from the state averages. Most strikingly, the northeastern Bavarian border area and the Ruhr area in North Rhine-Westphalia diverge from the patterns of their respective federal states. Without the northeastern Bavarian districts, the state would be the longevity forerunner in Germany, leaving even Baden-Württemberg behind. Similarly, North Rhine-Westphalia would rise considerably in the federal state ranking without the problematic Ruhr districts (cf. Klapper et al. 2007). Even in Baden-Württemberg, there are substantial mortality differences between the districts (von Gaudecker 2004). Berlin, with its special historical situation, stands out somewhat from the general eastern German pattern. The city's surrounding areas, especially Potsdam-Mittelmark, have exceptionally low mortality, which may be the result of selective migration patterns.

As a result of the trends in regional life expectancy, dispersion both across federal states, as well as across districts, increased during the process of reunification in the early 1990s and decreased over the rest of the 1990s. Subsequently, the regional

dispersion of life expectancy leveled off. Some increase in the regional longevity dispersion can be observed in West Germany since the late 1990s (Chaps. 3 and 4).

Urban-rural differences in Germany are small, with rural areas of western Germany and urban areas of eastern Germany enjoying lower mortality. With time, however, the eastern German urban advantage has been decreasing, which suggests that the urban-rural mortality pattern in eastern Germany could eventually resemble that of western Germany.

The most salient features of regional longevity patterns can be expressed through a classification of the districts into four mortality clusters based on the life expectancy level and the life expectancy increase over time. A cluster analysis identified three different patterns of life expectancy increases for the four clusters. As the cluster with the lowest life expectancy experienced the greatest gains in life expectancy over time, it gradually came to resemble the other three clusters with higher life expectancies. Age- and cause-specific mortality differed considerably in the levels, though to a lesser extent in the structures between the clusters (Chap. 4).

How do age- and cause-specific mortality contribute to these regional patterns, and to changes in these patterns? Are there different underlying age- and cause-specific distributions that produce the same overall mortality outcome?

In relative terms, regional mortality variation tends to be greater at younger ages. Total and absolute life expectancy variation across regions is explained to a large extent by mortality variation in infant mortality, and in mortality at ages 50–85, that is, the ages at which the majority of deaths occur. The East German age pattern deviates somewhat from the West German pattern. In East Germany, mainly due to traffic accidents, the mortality of young adult men varies considerably. This contributes to dispersion of regional life expectancy, as well as of mortality at young and old ages. Between the 1990s and the 2000s, the age-specific contributions to regional dispersion shifted toward older ages in both East and West, and the importance of accident humps diminished (Chap. 3).

Compared to all-cause mortality, spatial patterns of cause-specific mortality are more diverse, and the respective regional differences tend to be greater.

The spatial pattern of cardiovascular mortality resembles and shapes the pattern of all-cause mortality. In contrast to the all-cause pattern, respiratory mortality is lowest in eastern Germany, but it is particularly high in many areas of North Rhine-Westphalia, Rhineland-Palatinate, and northern Bavaria. Large regional mortality differences are also found in external and alcohol-related causes. Excess external mortality prevails in the countryside, while alcohol-related mortality is higher in the cities. Notably, the causes that exhibit the strongest regional gradients usually also show strong mortality differences with respect to socioeconomic status (cf. Leon 2001).

Across the four clusters determined by life expectancy and its changes, age- and cause-specific mortality changed gradually. However, the cluster with the lowest life expectancy experienced unexpectedly high levels of external and alcohol-related mortality during the 1990s. Steep decreases in mortality from these causes contributed the most to the mortality convergence of the four clusters (Chap. 4).

The study showed that the regularities that are characteristic of life expectancy also dominated the age- and cause-specific mortality patterns; that is, generally high

or low mortality was seen over all of the age groups and all causes of death. However, there are some exceptions in which different age- and cause-specific mortality trajectories produced the same overall mortality outcome (Chaps. 3 and 4).

Lifespan disparity, which measures the variation in the age-at-death distribution, indicates the average number of years lost due to death. While mortality reduction at any age leads to an increase in life expectancy, only the prevention of early deaths reduces lifespan disparity (Shkolnikov et al. 2011; Vaupel and Canudas Romo 2003). The measure is therefore an important complement to life expectancy when it comes to assessing age-specific mortality inequalities. It appears that regional patterns in lifespan disparity differ from regional patterns in life expectancy.

Before reunification, East Germans experienced lower lifespan disparity than West Germans at the same life expectancy levels. This can be explained by lower East German mortality at young and working ages, combined with excess mortality at older ages, a pattern that is characterized by lower variability in ages at death.

The comparison of lifespan disparity between federal states shows the importance of having a balance between mortality at younger ages and mortality at advanced ages. The same life expectancy can be produced by a combination of lower young-age and higher old-age mortality, or by higher young-age and lower old-age mortality. However, higher lifespan disparity corresponds to the latter combination, as was observed in the German city-states, such as Hamburg and Bremen. The city-states are among the federal states with the highest lifespan disparity and the highest life expectancy losses (Chap. 3).

What factors explain mortality variation between individuals and between regions? Are the determinants of mortality differences between regions different from the mortality determinants that drive the mortality change in the regions over time?

The variation in mortality risks is greater between population groups than between regions. This study provides evidence that the socioeconomic position of both individuals and regions predicts mortality in Germany (Chaps. 4 and 5).

Individual-level determinants of old-age mortality reveal strong social gradients. In addition to an obvious mortality effect of early retirement that reflects disability, all of the social status variables produce strong impacts on mortality. The lowest levels of mortality are found among high-income pensioners and among those who were active as white-collar employees. Mortality risk gradually increases with decreasing lifetime earnings. Pensioners with compulsory public health insurance have higher mortality risk than those with private or voluntary public health insurance. Independent mortality effects of single determinants remain even if all of the other individual-level determinants are controlled for, but this substantially decreases the strength of the effects of the single individual-level determinants (Chap. 5).

District-level analyses revealed an association between regional life expectancy and average per capita income, the educational level (of school graduates), and the effectiveness of health policy (high quality of health care and successful management of behavior-related diseases) implementation across districts. To a lesser extent, this association existed between regional life expectancy and GDP per capita. In western Germany, the regional pattern of life expectancy was also found to be associated with population change, while in eastern Germany, it was shown to be associated

with average living space. Not all of these cross-district relationships hold true with respect to changes in district-specific life expectancy over time. Notably, per capita income, living space, and effective health policy changes were found to be related to life expectancy changes over time.

In general, the regional pattern of life expectancy is above all associated with regional differences in socioeconomic factors. From the perspectives of both space and time, per capita income and the level of efficiency of the implementation of health policies are the strongest predictors of mortality (Chap. 4).

What is the role of the East-West divide in the mortality variation across space and time?

East-West differentials are recurrent issues when mortality differentials within Germany are examined, and they are also pertinent in this study. In the early 1990s, almost all mortality patterns showed this divide, despite the considerable convergence that took place over the 1990s, especially among women. In the mid-2000s, life expectancy of East and West German districts widely overlapped among women, with the East German districts being only slightly below West German districts. Among men, the life expectancy of the lower half of West German districts overlaps with the life expectancy of the better-performing East German districts (Chap. 4).

Even though overall mortality in several federal states and in many districts does not differ between eastern and western Germany, the study found evidence that different cause-of-death structures (and/or coding practices) prevail in the East and in the West. These differences are exemplified by the remainder group of "other causes" (and, in particular, ill-defined causes), which is consistently smaller in the East German regions, and also by the respiratory mortality group, which is smaller in the East German districts (Chaps. 3 and 4).

Several explanations for the East-West mortality gap before reunification, and the converging mortality that followed, have been proposed (reviewed by Diehl 2008; Dinkel 2000; Luy 2004). They include positive and negative migration effects, the health care system, the economic situation, psychosocial conditions, and environmental pollution, as well as lifestyle factors, such as smoking, alcohol consumption, and nutrition. These factors are partly related to specific situations that differ in eastern and western Germany. Factors like socioeconomic conditions, occupational structures, or environmental problems differ greatly within Germany, and not only between East and West. In addition to what was already known, our analysis revealed that existing spatial differences in districts' life expectancy, and their changes in eastern and western Germany, can largely be explained by differing socioeconomic structures across the districts. If the respective differences were eliminated, similar life expectancy outcomes would be expected in the East and in the West (Chap. 4).

The East-West effect in regional mortality in Germany hence remains, though its importance appears to be decreasing with time.

Do differences in population composition across regions account for all small-area mortality variation in Germany? What regional-level context factors explain the remaining small-area mortality variation? Is there evidence that the regional context alters the mortality impact of individual-level mortality risk factors?

Differential regional population composition across districts does not explain the entire mortality variation. Variation of age-standardized mortality across districts becomes larger when additional individual-level variables are controlled for among men, though it becomes smaller for women. However, all individual-level mortality determinants are of great importance in explaining general mortality variation between population groups. The increase in the regional mortality variation, when individual-level factors are controlled for, suggests that the prevalence of individual risk factors differs across districts and/or that the mortality impacts of individual risk factors differ by region.

However, the regional context also contributes to the mortality variation across districts. District-level unemployment level explains a large part of the variation, which suggests that higher-unemployment regions experience higher mortality levels. After individual-level factors are controlled for, about 40% of the remaining male and about 25% of the remaining female regional variation can be attributed to multiple regional-level context factors. District-level unemployment is the strongest context factor and is a strong indicator of the social and economic district-level context.

The regional context matters. The study found evidence that the strength of the effect of an individual-level mortality determinant is modified by regional context conditions. Specifically, the social mortality gradient was shown to be greater in more deprived areas, as living in these areas appears to have particularly detrimental effects on old people with low socioeconomic status. Conversely, high socioeconomic status appears to protect the elderly from the adverse conditions associated with living in a deprived area (Chap. 5).

In sum, the regional mortality pattern in Germany is characterized by a gradually diminishing East-West and a persisting North-South gradient, though some areas, like Saarland and the Ruhr area, diverge from the general pattern. Old-age mortality levels are driving the regional mortality differences, though there are also significant differences in mortality levels among young and working-age adults. Regional mortality patterns are related to differences in population composition, as well as to different area-level socio(economic) characteristics.

6.2 Discussion

This concluding part briefly summarizes the context in which the study of regional mortality differences is embedded. It highlights some important scientific contributions of this study, reflects on its shortcomings, and offers suggestions for future research. In addition, some potential mortality scenarios are outlined.

Germany exhibits substantial regional mortality differences and has also experienced significant changes in its regional mortality pattern over the past two decades. From a broader European perspective, Germany appears to have a medium level of regional mortality inequality when heterogeneity in population and region sizes across the countries are taken into account (European Communities 2009; Valkonen 2001).

This study on the regional mortality differences in Germany has highlighted mortality disparities at different levels, although the question of how (regional) excess mortality can be reduced in order to minimize these inequalities has yet to be addressed. There is still a strong need to further reduce excess mortality at young ages, especially in behavior-related causes of death. This will require taking a regional perspective, as certain areas are more affected by excess mortality at these ages than others. The study furthermore showed how close the links are between regional mortality levels and socioeconomic inequalities. Policymakers should be aware of the interplay between individual- and regional-level mortality risk factors and pursue a multisectoral approach in reducing mortality inequalities.

Studying the regional forerunners of low mortality illustrates the potential for global pathways to increased longevity. The potential for mortality reductions is, in some respects, obvious. The study showed that the regions with the highest life expectancy are not necessarily the forerunners in the reduction of unnecessary deaths. This is, for example, the case in Baden-Württemberg and Bavaria, two regions with high life expectancies, but where external cause mortality is not consistently low in all of the high life expectancy districts. Reducing this excess mortality would therefore result in even greater life expectancies. This shows the potential of mortality reductions that have already been realized and that are possible pathways to greater longevity.

Regional mortality variation in Germany was investigated at the level of federal states and districts. This study is embedded in the processes of demographic change in Germany, as mortality contributes to population aging and decline, and the size of the elderly population is mainly determined by mortality, as migration levels become very low after retirement. Germany is an interesting case to examine when studying regional demographic change, as the country has both shrinking and growing regions, as well as one of the highest shares of the elderly in Europe. Gaining knowledge about trends in mortality, fertility, and migration rates is crucial because these demographic indicators form the basis of population forecasts, and even small differences in these indicators can have a significant impact on population size in the long run. Regional population forecasts are the basis for regional planning in such diverse fields as education, public transport, and health care. Understanding the (regional) mortality distribution and its changing inequalities is therefore important for future planning.

The principal focus of this study was on identifying regional mortality trends over time, as well as the reasons behind these differentials. This investigation benefited from important innovations that this study introduced in the research area of regional mortality differentials in Germany and hence contributes to a gain in scientific knowledge in multiple aspects.

Our database was comprised of large sample sizes for several years, mostly of full samples of the population residing in Germany. It included time series data, which made it possible to investigate changing small-area mortality differentials over time. A large number of variables were incorporated and enabled us to look at possible mortality determinants.

One of our innovative contributions to regional mortality studies is the analysis of how lifespan disparities reflect inequalities in age-at-death distributions, in addition

to the average length of life. It showed that different age-specific mortality pathways lead to comparable life expectancies, but also to different lifespan disparity values, as is demonstrated by the East-West mortality gap in Germany. A one-dimensional look at only regional life expectancy would mask the fact that an East-West gap in the inequality in age at death was not observed. Insights into inequalities such as these should be taken into account when policy measures to reduce mortality are being formulated.

As the basis of small-area mortality differences, spatial statistics revealed hot spots of low and high life expectancy, and the dispersion measure of mortality provided an objective measurement of the time trends in overall spatial mortality inequalities.

Through the inclusion of individual-level data, advanced techniques of multilevel modeling allowed to perform complex analyses. This permitted to disentangle effects of population composition and regional (contextual) effects on mortality variation across districts. Such an approach had previously been identified as a pressing need in this research field (Mielck 2007; Razum et al. 2008). This study is the first that makes use of the data provided by the German Federal Pension Fund, with its virtually full sample of the German population aged 65 years and older, in the analysis of small-area mortality differentials.

The meaningful combination of various data sources at different geographical levels and state-of-the-art analytical methods made it possible to draw conclusions from different perspectives, such as the cause-of-death patterns or the socioeconomic contexts. This provides strong empirical evidence for explanations of regional mortality disparities and a solid basis for the formulation of effective policies to reduce these disparities.

The study has several limitations, which are mainly related to the restricted availability of mortality-relevant data at the small-area level. Despite the large sample sizes, some districts still have rather small population numbers, which can present problems when, for example, specific causes of death are considered. Several questions that could not be adequately addressed in this study remain open for future research.

Several variables were not available for these analyses. For the regional context variables, it would have been desirable to have had indicators of income inequality, the educational level of the entire population, or various health-related behaviors. These variables are not, however, available at the small-area level over time. In addition, the individual-level data have some limitations. These data only contain a limited number of variables, which are all time constant. Because of these limitations, it is not, for example, possible to follow people's life courses and to examine dynamic interactions between death hazards and changing explanatory variables.

Alcohol, tobacco, high blood pressure, and high cholesterol have shown to contribute the most to the disease burden in the developed regions of the world, causing a multitude of diseases (Ezzati et al. 2002). However, there are a few mortality predictors from health care and lifestyle research that are suitable for inclusion in a study of regional mortality differences. The regional distribution of alcohol-related mortality and its impact on life expectancy differences between different types of

regions in Germany have been shown in this study. In addition, lung cancer mortality as a proxy for smoking-related mortality has been included here.

Smoking has frequently been described as the single most important factor producing premature mortality (Ezzati et al. 2002) and as the factor that underlies many mortality inequalities between population groups (Pampel and Rogers 2004; Rogers et al. 2005). It appears that lung cancer enforces the predominant regional mortality pattern among men in Germany. Among women, the predominant regional mortality pattern is somewhat counteracted by lung cancer mortality, which is especially low in the East.

In the field of health-care provision, the type of health insurance was included as an individual-level variable. This showed that people in private health insurance plans had a greatly lowered mortality risk. Although it is often assumed that health care in Germany is universal, the results suggested that adequate treatment is not universally distributed across all population groups and that it is probably not equally distributed across regions (Lampert and Kroll 2006; Mielck 2005; Rosenbrock and Gerlinger 2004). At the contextual level, classical health-care indicators did not help to explain regional mortality differences.

Future studies should attempt to make the effects of lifestyle and health-care factors on regional mortality differences more explicit, as they are more proximate determinants than socioeconomic factors. From a theoretical point of view, more meaningful indicators reflecting the quality and accessibility of health care at the contextual levels should be developed in order to identify deficiencies in the health care system. At the individual level, the fact that the privately insured live longer than those in compulsory health insurance, independent of their socioeconomic status, is striking. This raises the question of whether prevention and medical care are better for those who are privately insured or whether there are distinct selection effects into private health insurance. From the lifestyle factors determining regional mortality differences, the role of smoking could, for example, be assessed by indirect methods of smoking-attributable mortality (Peto et al. 1992; Preston et al. 2010). It is important to note that both lifestyle and health-care factors appear to be sensitive to socioeconomic deprivation, which has been shown to be associated with regional mortality differences in Germany.

In this study, federal states and especially districts were chosen as territorial units. However, it would have been desirable to have examined the relationship between the socioeconomic characteristics of the individuals and the socioeconomic spatial context in which they are embedded at different geographic scales. This might have shown whether the chosen district level is the most indicative. If data availability had allowed for a more detailed analysis at the neighborhood level of bigger cities such as Berlin and Hamburg, the results might have been more informative (cf. Meinlschmidt 2008).

The consequences of the possible influences of a healthy migrant effect on regional mortality cannot be satisfactorily addressed by the currently available data. It is likely that low mortality in certain regions is the result of favorable general conditions and that it is further strengthened by healthy in-migration. At the regional level, the presence of a healthy migrant effect cannot be disentangled from the

general effects of favorable socioeconomic environments, which attract migrants. In order to control for this effect, a life course perspective would be necessary, and longitudinal data including migration histories would be required.

A life course approach would allow researchers to follow people over time, along with the different contexts they are exposed to. This approach would make it possible to assess in which age groups contextual conditions influence health the most. While it has been previously shown that early life conditions can have an impact on mortality later in life (Doblhammer 2004; Elo and Preston 1992), by applying a life course perspective, the changing impact of contextual conditions at different ages over time and the cumulative impact of context could be derived. Furthermore, a longitudinal approach would allow for a comparison of the mortality situation in the region of origin and the destination of the movers. At different regional levels, researchers could assess to what extent selective migration distorts observed regional mortality differences. The results of such research would contribute to a refinement of policy interventions that could then be implemented at different levels.

At the small-area level, the pattern of mortality laggards and leaders was found to be very similar between males and females in the mid-1990s (though at different mortality levels). Within the relatively short period of just over a decade, the picture became spatially diverse between the sexes. Future research should investigate why the mortality impact of the regional context differs by sex. It is, for example, obvious that different sex-specific and regional (time-lagged) smoking patterns lead to different lung cancer patterns by sex and region. This may be the case with other risk factors and related cause-of-death patterns as well, but it is more difficult to disentangle them from other risk factors and subsequent diseases. However, the spatial mortality pattern has changed quickly, and the latency periods between adverse exposure, diseases, and deaths are typically longer.

In the German context, the question of why mortality fell so sharply among eastern German women after reunification is of special interest. Several factors could have had an impact, including medical care, psychosocial stress, material factors, and selection effects. In the long run, it will be interesting to observe whether today's smoking patterns—with higher smoking prevalence among young East German women (Luy 2005; Mensink and Beitz 2004; Müller-Nordhorn et al. 2004)—will have a countervailing effect. In order to learn more about the effects of crisis events on mortality, a comparison between the mortality effects of the "mortality crisis" after German reunification, and the effects of the 2007–2010 financial crisis on mortality, might be worthwhile.

New problem areas in western Germany have arisen, as some old-industrialized areas, such as the Ruhr area, are currently unable to catch up with life expectancy increases observed in other regions. An attempt to limit regional divergence in mortality trends would need to pay special attention to those regions to prevent a worsening of these health disadvantages. Researchers may want to conduct case studies that compare those disadvantaged regions with other regions that were in a similar situation but managed to overcome the challenges of economic transition.

In spite of the aforementioned limitations, the author is confident that the analyses describe the major regularities of regional mortality variation in Germany correctly

and that this study contributes to the knowledge gain of regional mortality trends and their determinants.

Despite the strong convergence in life expectancy across all German districts in the 1990s, regional mortality divergence may nonetheless occur in the near future. Slight trends toward regional divergence in mortality are already visible in West Germany. The success story of East German women, whose mortality rates declined substantially after reunification, could be attenuated over the coming decades due to current smoking patterns. Given the close relationship between mortality and (socio) economic determinants in the regions, the regional concentration of economic prosperity that is expected to occur in the future (cf. Kröhnert et al. 2006; Neu 2006) is likely to accelerate trends toward regional mortality divergence.

At the same time, social differences in morbidity and mortality tend to rise over time in Western European countries (cf. Mielck 2008; Valkonen 2001), including in Germany (Lampert and Kroll 2008; Mielck 2008; Scholz and Schulz 2008). The tendency toward mortality divergence between regions may be reinforced by widening mortality inequalities between population groups.

This study sheds light on the complex interplay between health and place in Germany. The study of regional mortality differentials nevertheless remains an important field of research. Research should focus simultaneously on regional-level mortality patterns and on mortality trends in various population groups. This requires the development of more comprehensive datasets, including broader age ranges and more extensive sets of explanatory variables.