

Chapter 7

Inequalities in Life Expectancy Between and Within European Countries

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7.1 Introduction

Inequalities in life expectancy between and within European countries opens up a wide field for questions, research, and interpretative analysis.¹ Inequalities in human well-being are one of the major features of our world. Even if a distinction can be made between inequality, often considered as largely unavoidable and sometimes even necessary to the functioning of societies, and inequity, which is unacceptable and should be eliminated by appropriate policies, some inequalities are judged as more inequitable than others. This is the case for inequality in death. Even if, very probably, perfect equality in length of life could never be achieved between individuals because of a certain number of irreducible biological differences, it is generally considered that inequalities among populations can, for their part, be reduced, if not eradicated, by appropriate policies. Nowadays, there is broad consensus among political institutions and public opinion on this matter, since such differences have been identified and fully acknowledged. But, as yet, recognizing inequalities in life expectancy and fighting them by policies and programmes has proved to be far from sufficient to eliminate them. Even within a rather homogeneous region of industrialized countries like Europe, huge inequalities still exist, both between countries and within countries.

¹ On the occasion of the Symposium *The Demography of Europe* organized in honor of Professor Jan M. Hoem, I was invited to make a presentation on this topic. This chapter is based on this presentation.

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Indeed the matter is quite complex and an entire book would not be enough to fully cover the various aspects of life expectancy differentials. Without any claim to do so, the first part of this paper will be devoted to describing some of the major features of the phenomenon. Even more difficult and certainly without any hope of providing definitive evidence, the second part will be an attempt to explain the current diversity of situations.

7.2 Describing Diversity

A first level of life expectancy inequalities emerges when comparing countries, and differences arise from various aspects of national mortality patterns and trends, some of which will be mentioned in [Sect. 7.2.1](#), while [Sect. 7.2.2](#) will show a few examples of sub-national diversity.

7.2.1 Diversity Between Countries

In spite of their economic, social, demographic and cultural similarities, European countries show a broad range of life expectancy levels, largely due to the fact that trends observed in the recent decades resulted in a considerable divergence between East and West. But such divergence is not only a matter of levels achieved, it is also due to diverging changes in the structure of mortality.

Level Diversity

According to data of the Council of Europe, in 2004, life expectancy at birth, for both sexes, ranged from 65.6 years in Russia to 81.3 years in Iceland. For the 46 countries covered (including Turkey and Caucasian countries), the mean is 75.6 years. Only five countries, however, (Slovakia, Poland, Czech Republic, Slovenia, and Denmark) recorded levels within the range of 74–78 years, and standard deviation is rather high: 11.2 years. This reflects the dramatic gap observed today between Eastern and Western Europe. It is quite surprising to realise that all four western countries of the former USSR (Belarus, Moldavia, Russia, and Ukraine), where the expectation of life ranges between 65 and 69 years, have lower life expectancies than Turkey or the Caucasian countries.² At the other end of the spectrum, the most advanced countries are the Netherlands and Iceland with more than 81 years of life expectancy. In fact, according to [Fig. 7.1](#), the

² Estimates from current statistics in these countries are not as reliable as for the others. However, the estimates given by the Council of Europe for Armenia and Georgia for 2004 are not far from the results of a very recent deeper analysis ([Duthé et al. 2009](#)). In Turkey, rather good data are provided by surveys.

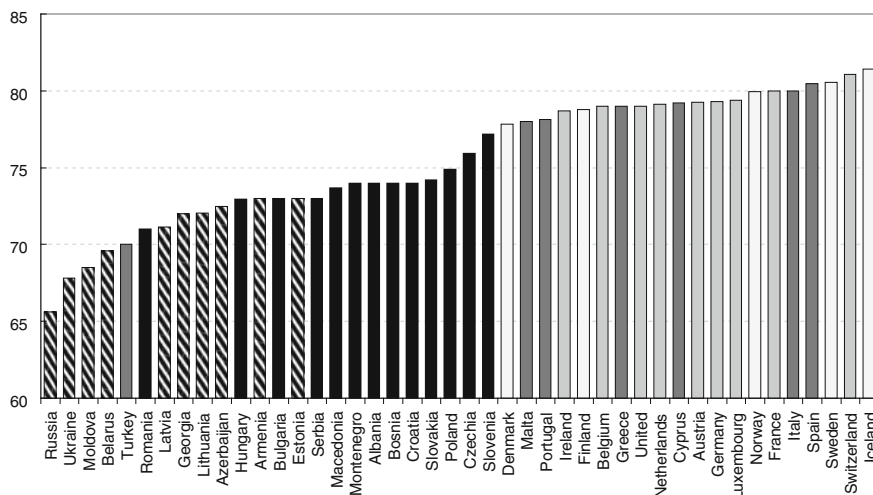


Fig. 7.1 Life expectancy in Europe in 2004. *Source* Council of Europe (2006)

spectrum is clearly divided into three rather homogeneous groups: the former USSR countries, the other former Communist countries, and all the other countries, which comprise the Mediterranean countries, the Western European countries, and the Nordic countries. The first group is the least homogeneous, with life expectancy ranging from 65 to 73 years, largely because the Baltic countries with about 73 years of life expectancy overlap with the other former Communist countries. Most of the latter fit into a very short interval, between 73 and 74 years of life expectancy, but the three most advantaged countries, namely Poland, the Czech Republic, and Slovenia, make a clear transition towards countries belonging to the upper range of life expectancy in Europe. By contrast, this upper category is no longer well divided into the classical distinction between Mediterranean, Western and Nordic countries. The very narrow range between 78 and 80 years of life expectancy includes most western countries except one but also several Mediterranean and Nordic ones, while the three less advantaged countries in this group include one Nordic (Denmark) and two Mediterranean ones (Malta, Portugal). At the same time, the four most advantaged countries include one Mediterranean (Spain), one Western (Switzerland) and two Nordic ones (Sweden, Iceland).

The present clear break between Eastern and Western Europe results from a radical change that has occurred during the last four decades. Figure 7.2 has been drawn in such a way that the ranges of life expectancy remain the same from period to period, so that one can observe the changes in life expectancy across Europe over the period 1950–2004. Thanks to general progress, life expectancy in the ranges of 66.3–73.3, which were totally absent in 1950, occupy a very large surface in 2004, while life expectancy below 59.3 years or between 59.3 and 62.7 years, widespread in 1950, have disappeared in 2004. However the most impressive fact is the change in the way Europe is divided.

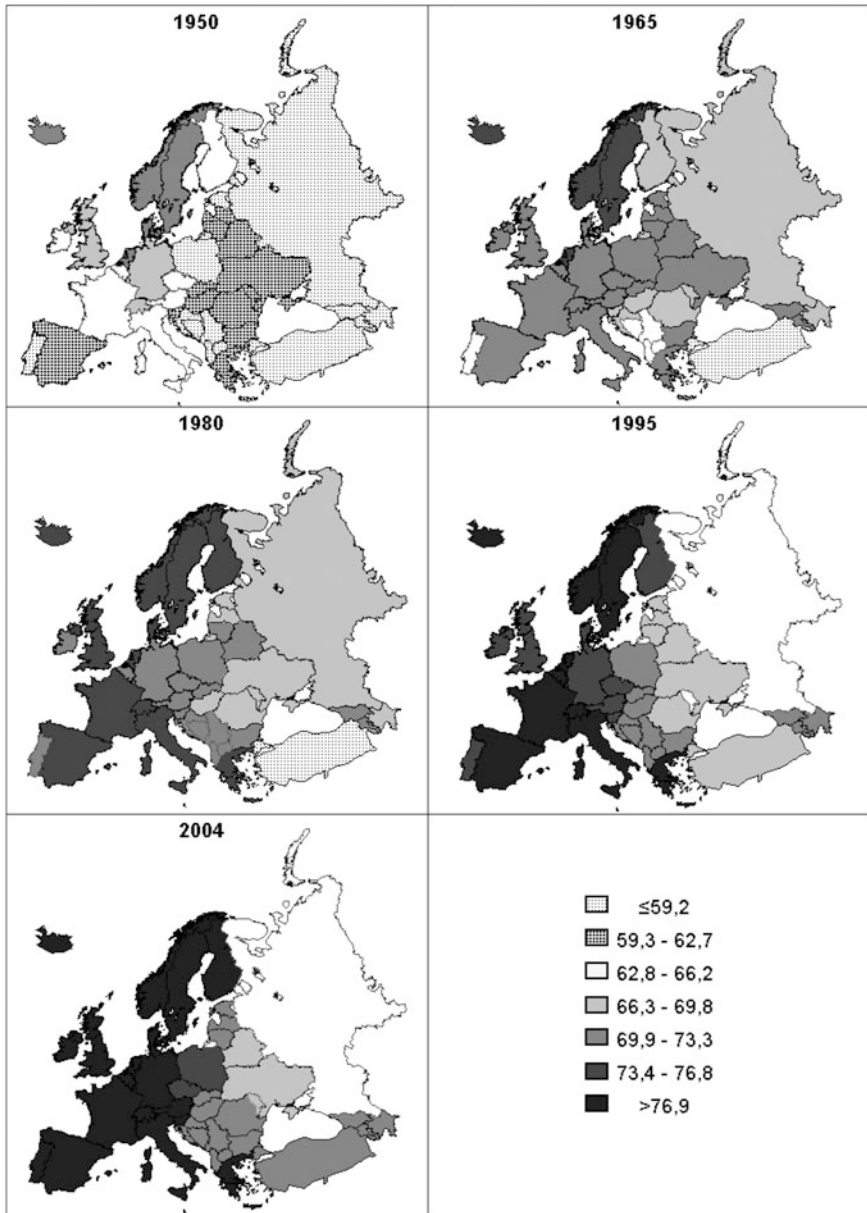


Fig. 7.2 The changing geography of life expectancy in Europe (1950–2004). *Source* Council of Europe (2006), own calculations

In 1950, there was a strong contrast between a typical northern cone including the four Scandinavian countries (Iceland, Denmark, Norway, Sweden) and the Netherlands, and a southern-eastern half circle from Portugal to Russia.

Fifteen years later, in 1965, this contrast had almost disappeared after a huge movement of convergence that resulted in a much more homogeneous map largely ranging between 69.9–73.3 and 66.3–66.8, close to the mean. The only major contrast is the opposition between Turkey in the South (with life expectancy still below 59.3 years) and the Nordic cone (except Denmark), with a life expectancy of already 73.4–76.8 years. Then, by 1980, the Mediterranean countries join the Nordic ones with a life expectancy of 73.4–76.8. By 1995 all Western European countries have a life expectancy within this range, and the Mediterranean countries as well as the Nordic countries (except Denmark, Finland, and Portugal) even have a life expectancy above 76.8. By contrast, between 1980 and 1995 life-expectancy in Russia and in the Ukraine, Belarus, and Moldova dropped, so that by 1995 these countries belonged to groups with lower life expectancies than they did in 1980. The other former Communist countries retained their life expectancy or increased it to the range of 69.9–73.3, with the remarkable exception of Poland and the Czech Republic that finally joined the group of countries with a life expectancy of 73.4–76.8. The contrast between East and West, quite perfect in 1995, is broken by these two exceptions (Poland and Czech Republic) that are quite significant as we shall see later.

Structural Diversity: Age Patterns

Furthermore, life expectancy is only a summary of life tables built to combine age-specific mortality rates. The diversity of life expectancy levels may conceal additional diversity in terms of the age structure of mortality, which may or may not be linked to the level of diversity.

In a previous work published a few years ago with France Meslé (Meslé and Vallin 2002), a hierarchical analysis was applied to a set of 28 European countries³ with a population of at least one million for which we were able to collect statistics on the probability of dying by five-year age groups, for periods of several years around 1965 and 1995. Figure 7.3 illustrates the results obtained for these two periods centred on the same years as the second (1965) and the fourth map (1995) of Fig. 7.2.

In 1965, the situations for both males and females varied sufficiently to establish a distinction between several groups of countries in the dendrograms (i.e. tree diagrams), but no clear contrasts emerge. One group does seem to stand slightly apart from the rest, although it is made up of countries which are not all

³ Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, East Germany (GDR), West Germany (FRG), Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, and Yugoslavia.

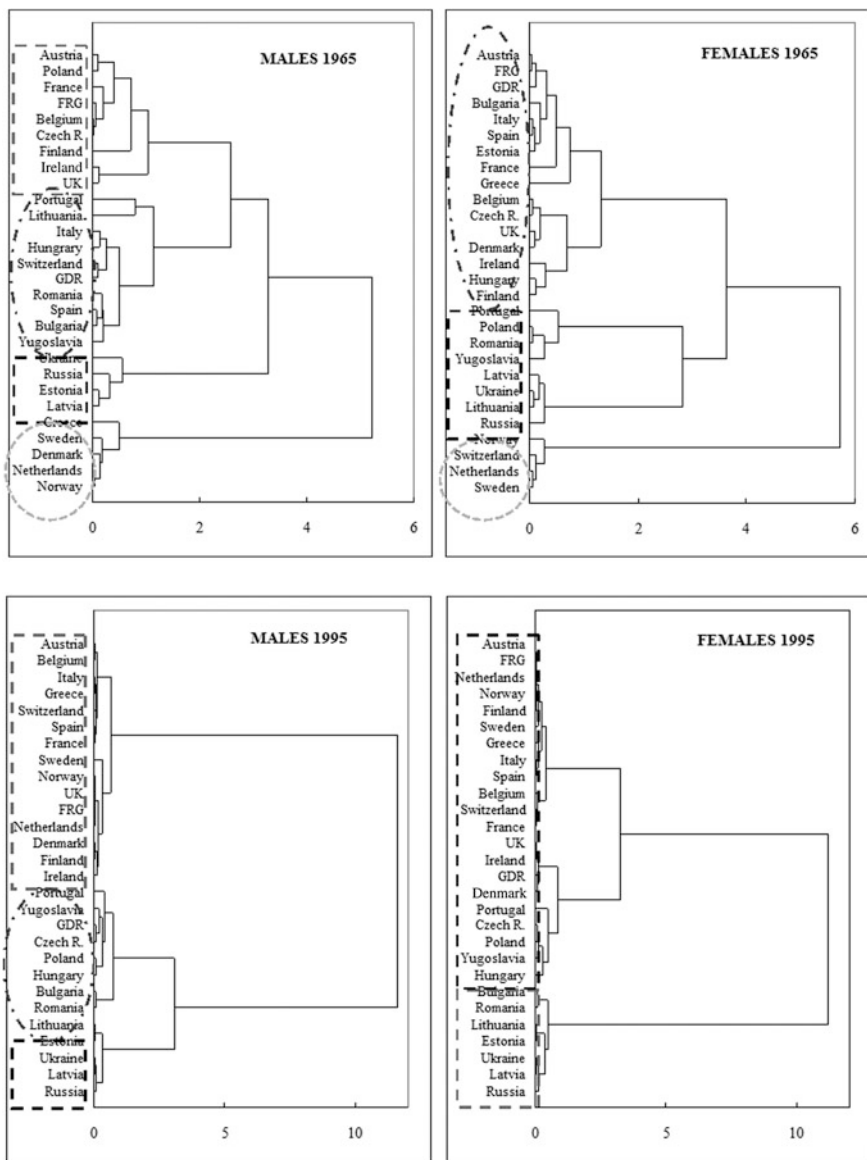


Fig. 7.3 Summary dendrogram for age-specific probabilities of dying in 28 European countries, in 1965 and 1995. Source Meslé and Vallin (2002)

geographically close to one another (Denmark, Greece, Netherlands, Norway and Sweden for males; Netherlands, Norway, Sweden and Switzerland, for females); moreover, the distance between the first and the second node is not much longer than that separating the two following nodes, and this pattern is repeated up to the

last branches of the tree. In fact, starting from the furthest node, one can increase the number of partitions at each level without reaching a stage where a final partition becomes obvious. A varying number of groups of countries can be isolated in this manner (possibly four for males and three for females, as underlined on Fig. 7.3), but without bringing out either any sharp contrast between them or any particular geographical logic.

On the contrary, in 1995, the dendrograms show a striking contrast between two or three groups of countries. Among men, the partition into three groups clearly separates, within the Eastern European group, the former USSR (Estonia, Latvia, Lithuania, Russia, Ukraine) from the other former Communist countries (Bulgaria, Hungary, Poland, GDR, Czech Republic, Romania, Yugoslavia), to which one must add Portugal. The case of Portugal is, in a way, an exception confirming the rule. Indeed, as will be seen below, the main factor of divergence in the mortality patterns corresponds to the modification of death risks at adult ages and, in this respect, the situation of Portugal is rather atypical for Western Europe, since the mortality rate among young adults is abnormally high compared to that of other age groups. In order to divide the third group of males into two sub-sets, one has to go very far down in the dendrogram, where two rather large, geographically well-defined groups can be found: a northern group, running from Western Germany to the British Isles and the Scandinavian countries, and a group of Mediterranean and Alpine countries, plus Belgium.

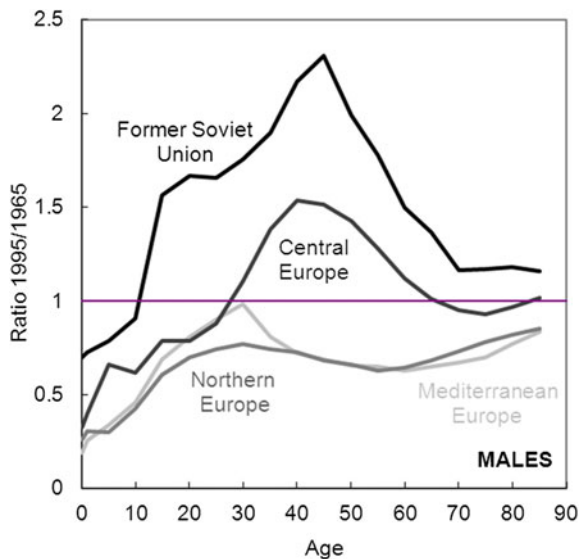
Among females, the divisions suggested by the 1995 dendrogram are slightly different. With three groups, the distances are quite long but the geographical continuity is not as marked. Central Europe does contrast with most Western countries but it remains associated with Portugal, the United Kingdom, Ireland and Denmark.

In fact, as we know, the differences in mortality have traditionally been greater among males than among females. Therefore, we compare four groups of countries resulting from the hierarchy among males in 1995, mainly to look at the radical contrast between the two first groups, East and West, but also at the differences shown by the two sets of sub-groups, namely:

- “Mediterranean and Alpine Europe”: Austria, Belgium, Spain, France, Greece, Italy and Switzerland (the inclusion of Belgium does not destroy the group’s geographical continuity);
- “Northern Europe”: Denmark, Finland, Ireland, Norway, Netherlands, West Germany, United Kingdom, and Sweden
- “Central Europe”: Bulgaria, Hungary, Poland, East Germany, Czech Republic, Romania and Yugoslavia (removing Portugal in order to preserve the geographical continuity of the group)
- “former USSR”: Estonia, Latvia, Lithuania, Russia and the Ukraine.

Figure 7.4 displays the ratio of the 1995 value of each age-specific death rate to its value in 1965, in the four groups.

Fig. 7.4 Relative change in age-specific mortality patterns in four groups of European countries, 1965–1995. *Source* Meslé and Vallin (2002)



The contrast between countries of the former USSR and Western countries is striking, while differences within the latter group are minute, as indicated by the short distance in the two sub-groups shown by the dendrogram. The Central European countries lie clearly in between. Thus, the East–West division of Europe is not only a matter of life expectancy level but also a question of age-specific patterns of mortality. During the past 4 decades, former USSR countries and, to a less dramatic extent, Central European countries were hit by a tremendous increase in male adult mortality while they continued to make significant progress in reducing infant mortality and while old-age mortality remained relatively stable. Western countries, on the contrary, succeeded in reducing mortality at all ages (except around age 30 in the Mediterranean group). Not only have levels of life expectancy diverged sharply since the mid sixties as shown in the maps of Fig. 7.2, but there has also been a striking distortion of the mortality age pattern of the former Communist countries while that of Western countries remains practically unchanged.

Structural Diversity: Age-and-Cause Patterns

What is true for age patterns is even more obvious for the cause of death structure of mortality. To vary the angle of view, let us consider the best observed life expectancy, the historical trends of which have been discussed recently (Oeppen and Vaupel 2002; Vallin and Meslé 2009). Does the maximum life expectancy observed at one moment in history fully reflect the most ideal mortality pattern? Certainly not. To achieve this objective it would be necessary for the country that enjoys the highest life expectancy to also be the one which enjoys the lowest mortality rates at each age and, even more, the lowest mortality rates at each age

for each cause. In a recent paper (Vallin and Meslé 2009) the world’s lowest age-specific and age-and-cause specific mortality rates were combined in hypothetical life tables for each year since 1950. Figure 7.5 compares the resulting life expectancies to the maximum life expectancy actually observed.

For females, the combination of the lowest age-specific mortality rates ($e_0 \text{ min-[A]}$) does not differ significantly from the maximum actually observed first in the Netherlands (from 1950 to 1965) then in Sweden (1966–1980) and finally in Japan (since 1981). This means that nowadays, the variance in mortality age patterns has become very low among the most advanced countries. The highest life expectancy country is also the one where almost all age-specific mortality rates are the lowest. However, this is not yet completely true. Around the beginning of the 1980s, when Japan replaced Sweden as the top-performing country for life expectancy, observed maximum life expectancy was slightly lower than $e_0 \text{ min-[A]}$ because the latter results from the combination of at least two different mortality age patterns, that of Japan, which did not yet surpass Sweden for every age-specific mortality rate, and that of Sweden, which did still better than Japan at some ages (not to mention other countries that may have done better than both Sweden and Japan for some ages). Age-specific patterns of mortality matter slightly more for males, for which a non-negligible gap between observed maximum life expectancy and $e_0 \text{ min-[A]}$ is shown in Fig. 7.5 throughout the 1960s and 1970s. But for both sexes, this gap is practically non-existent when compared to the distance between observed maximum life expectancy and the hypothetical one resulting from the combination of the minimum age-and-cause specific mortality rates ($e_0 \text{ min-[A*C]}$). When using 12 groups of causes, this distance ranges between 3 and 6 years of life expectancy depending on which sex and period one considers,

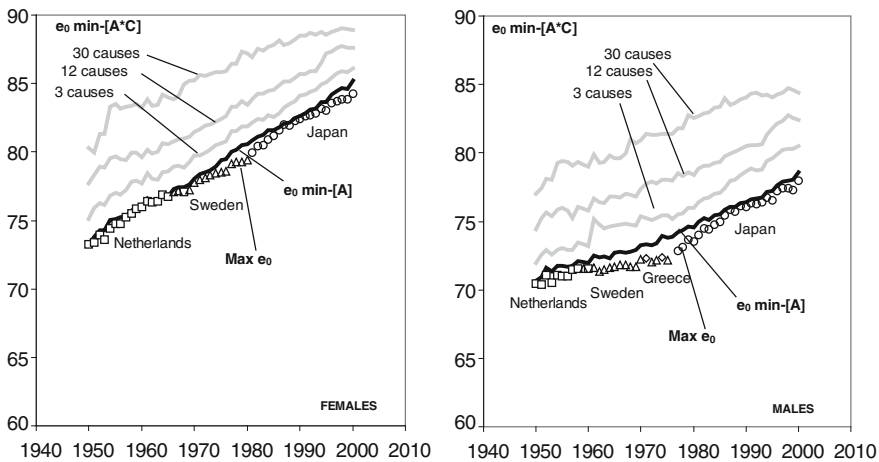


Fig. 7.5 Highest observed life expectancy ($\text{Max } e_0$) compared with different combinations of minimum age or age-and-cause specific rates ($e_0 \text{ min-[A]}$ and $e_0 \text{ min-[A*C]}$), 1950–2000. *Source* Vallin and Meslé (2008)

instead of mostly less than 1 when $e_0 \min-[A]$ is considered. Even at the extreme level of the highest life expectancy, mortality structure is an important factor of mortality diversity, especially when causes of death are considered. And, naturally, the larger the number of cause-of-death categories used, the greater is the observed diversity, as shown in Fig. 7.5, comparing three levels of cause-of-death groupings (groups of 3, 12 and 30 causes).

7.2.2 Diversity Within Countries

Since mortality is related to many economic, social, cultural and political factors, one might think that there is less diversity within countries than between countries. At least one of the major factors, the enormous economic difference existing between countries (GDP per capita is about 500 times higher in the world's richest countries than in the poorest), disappears when looking inside a specific country. But also, one might assume that countries are more homogeneous in terms of culture and behaviour, and that government action is able to reduce the effects of many factors of inequality through education, social policies, territorial equilibrium and, especially, health policy and health care systems. In reality, the causes of diversity are no fewer than the factors of homogeneity. Very likely it could be the reverse. Indeed there is only one way to distinguish countries (the borders), while sub-populations can be defined on the basis of many different criteria. Not only can sub-territories be compared, an approach to internal diversity that looks very similar to the cross country analysis, but many other criteria can be used to measure, for example, differences in life expectancy by sex, marital status, level of education, employment, occupation, social class, housing, nationality, religion, not to mention body mass index, cigarette smoking, alcohol consumption or even birth weight, length of gestation, genetic features, etc. And, naturally, various criteria can be combined to obtain increasingly homogeneous categories that will be increasingly different from other categories. Ultimately, this could be refined down to the level of differences between individual life expectancies (if life expectancy were not by definition a statistical mean). According to its discriminatory power, one or another criterion will lead to mortality diversity within a country that is sometimes higher than the level of international diversity, especially if several criteria are combined. For example, a linkage study (Jasilionis et al. 2007) based on four criteria (education, marital status, nationality, and urban/rural) showed that in 2001–2004, Lithuanian male life expectancy at age 30 differed by 11.2 years between married and widowed men (the most discriminatory criterion), but when the four criteria are combined, the difference between a high-educated, married, Lithuanian, urban man and a low-educated, unmarried, non-Lithuanian rural one went up to 27.5 years. This is much more than the distance between Japan and Russia (16.5 years).

Describing all possible life expectancy differences within countries is not possible here. Let us have a modest look at three of them, according to geography, sex, and socio-cultural groups.

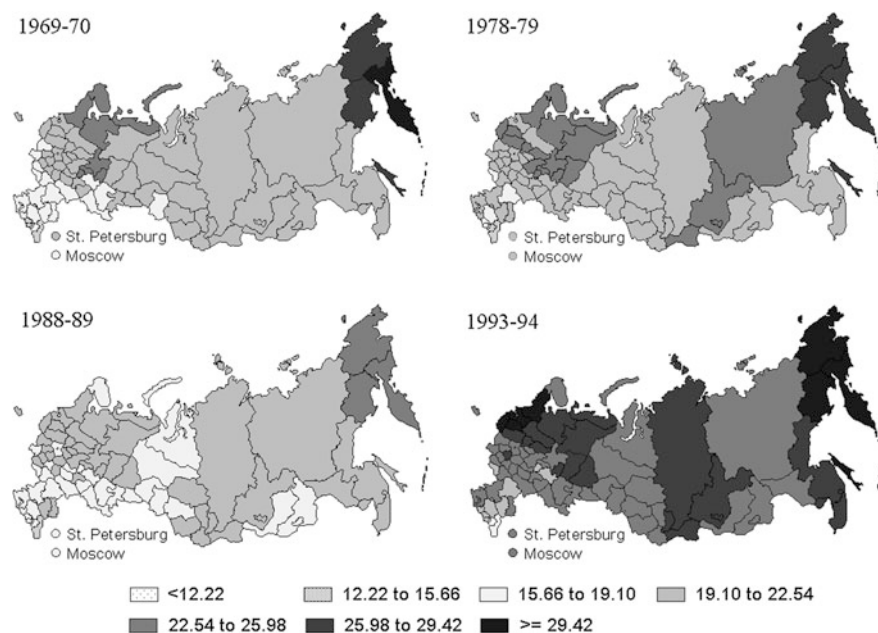


Fig. 7.6 Age-standardized male mortality rates among 73 administrative units in Russia in 1969–70, 1978–79, 1988–89 and 1993–94. *Source* Vallin et al. (2005)

Geography

Analysing geographic variations in mortality within a specific country is not very different from doing international comparisons. Everything said above could apply here. To avoid repetition and taking into account the greater comparability of data produced by the same statistical institution, I will mention here just one example of a more complex analysis that can be done by referring to the results of a collaboration between INED, the MPIDR and the Moscow Center for Demography and Human Ecology (Vallin et al. 2005). The study starts with four maps of the Russian geography of the variation in age-standardized male mortality for four periods centred on the last four censuses then available⁴ (Fig. 7.6). All four maps were drawn according to the same seven value classes of mortality levels.⁵

Changes from period to period are influenced by very different types of events that resulted in dramatic fluctuations in Russian life expectancy. From 1969–1970 to 1978–1979, the latter was slowly declining, as it had been doing since the

⁴ Not including the most recent one that came later, but including the so-called micro census of 1994.

⁵ The size of these classes is of one standard deviation, and the central one is centred on the mean all-Russia value for the four periods mixed together. In fact, since the range of values is much wider above than below this mean value, the central class is the third one.

mid-1960s. The geography of mortality did not change much. We see only large zones moving from one class to the next one reflecting a slightly higher mortality. From 1978–1979 to 1988–1989, the map was mostly impacted by Gorbachev’s anti-alcohol campaign that resulted not only in a general mortality decrease but also in a substantial homogenisation. The classes with age-standardized male mortality rates ranging from 15.66 to 25.98 expanded, while the highest range of mortality disappeared completely. Finally, the last transition, from the status in 1988–1989 (third map) to the status in 1993–1994 (fourth map), reflects the consequences of the dramatic mortality increase due to the severe economic and social crisis that followed the transition to a market economy. Consequently, the map reflecting the geography of mortality in 1993–1994 is much more covered by the higher ranges of mortality rates and the pattern differs significantly from the previous ones.

The question arises whether, in spite of all these changes, any geographical features are strong enough to resist such a hectic recent history. Figure 7.7, obtained from a cluster analysis, based on age-and-cause specific death rates of the four consecutive periods of observation, seems to give a clear answer. It reveals a contrast between the north (cluster 4) and the south of the European part of Russia. However, the south itself is made of two clusters, the western and central regions (cluster 1), and the southern rim closer to the Caucasus and Caspian Sea (cluster 2), but both of them extend into the Asian part (extreme south-west of Siberia), which roughly follows the fertile black soil or *chernozem* belt.



Fig. 7.7 Global clustering of the four period age-and-cause specific mortality rates (periods: 1969–70, 1978–79, 1988–89, 1993–94). *Source* Vallin et al. (2005)

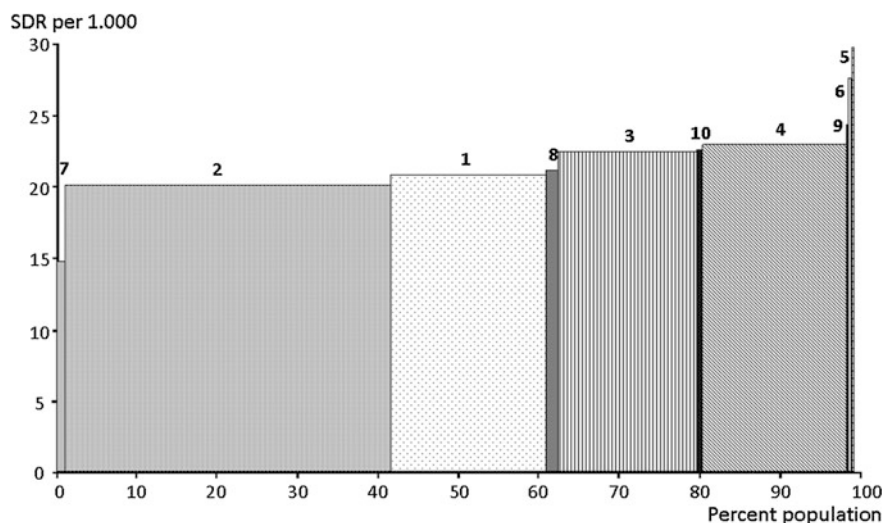


Fig. 7.8 Distribution of Russian male population by the 10 clusters, ranked by age-standardized death rate (four-period mean). *Source* Vallin et al. (2005)

The fourth important cluster (cluster 3) includes most of the western part of Siberia (from the Urals to Lake Baikal) with a southern extension towards Vladivostok and the Pacific Ocean. The other 6 clusters represent very specific and isolated cases like Dagestan (cluster 7) or Yakutia (cluster 10). Figure 7.8 shows that the first four clusters include an overwhelming share of the population, while the other 6 are very sparsely populated. But it also shows that the differences in mean levels of mortality observed over the four periods are not very large between the main clusters while most of small clusters lie at the extremes. The differences between the main clusters are due more to mortality patterns and changes than to mortality levels.

Indeed, Fig. 7.9 shows important differences in cause-of-death patterns between the four main clusters, as compared to Russia as a whole: For example, mortality from heart diseases, influenza/pneumonia and violent deaths is much higher in cluster 3 (Western Siberia), while chronic respiratory diseases have a much stronger impact in cluster 1 (Northern Chernozem belt) and accidental poisoning by alcohol is more characteristic of cluster 4 (North European Russia). Cluster 1 (Southern Chernozem belt) is mainly distinguished by lower mortality from alcohol poisoning.

Sex: When Geography Contradicts History

Sex differences in mortality are a fascinating topic, especially when approached from the dual viewpoints of geographic variation and historical trends. In a country like France (Vallin 2002), but also in various other European countries (Vallin

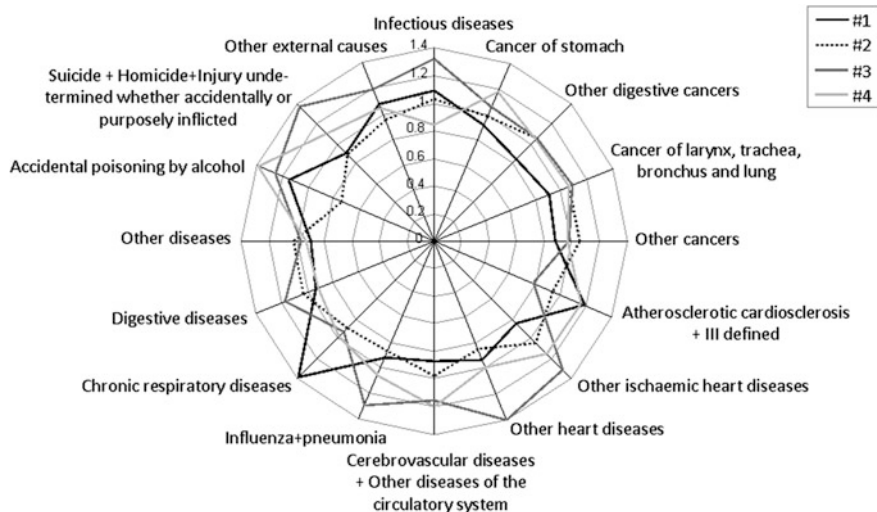


Fig. 7.9 Cause-of-death patterns of the four main global clusters compared to all-Russia. *Source* Vallin et al. (2005)

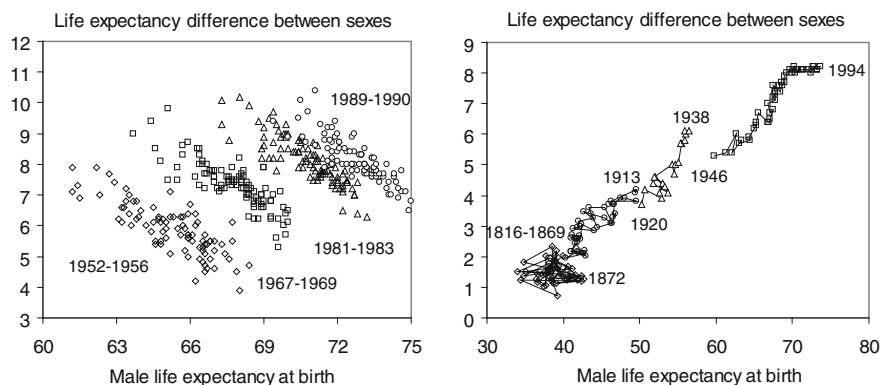


Fig. 7.10 Relationship between the gap in male and female life expectancy and the level of male life expectancy as observed in France among its “Départements” at various censuses and by year from the beginning of 19th century to the end of the 20th. *Source* Vallin (2002)

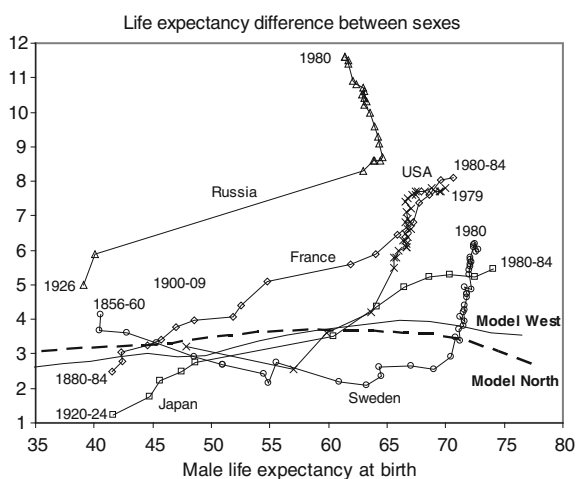
1990), when studied through geographical analysis, it seems that the higher the level of life expectancy, the narrower the gap between sexes, as shown in the left-hand graph of Fig. 7.10, at four successive French censuses. Each time, the cloud of points is clearly oriented in that direction. But from one census to the next the cloud goes up in the reverse direction, exactly like the sex gap for life expectancy in France, shown in the right-hand graph of Fig. 7.10: when life expectancy increases, the sex gap also increases.

This strange paradox gets its explanation when looking at causes of death as shown through a comparison between France and Russia (Meslé and Vallin 1998). As in many developed countries, the historical rise of life expectancy in France has been mainly explained by the decrease in infectious diseases up to the 1960s and then in the cardiovascular diseases. Sex differences increased in parallel, firstly because of the increase in male bad habits (excessive alcohol consumption, smoking, risky driving, etc.) and specific occupational exposure but also, more recently, because women were able to benefit from the cardiovascular revolution sooner than males. Altogether, it was quite logical for the sex gap to grow at the same time as life expectancy, at least until very recently. By contrast, French geographic variations in mortality are strongly related to the negative effects of alcohol consumption, which is also an important explanation for the sex gap. Quite logically, the larger the gap, the higher the level of mortality and the lower the life expectancy. It is for a very similar reason that in recent decades the Russian sex gap increased sharply while the level of life expectancy decreased, both trends being largely driven by alcohol consumption.

Sex differences are also a field where the best experts in demography have made wrong predictions. In the 1960s, Coale and Demeny (1966) published model life tables where after a slight increase in sex differences from lower to higher levels of life expectancy the relation was reversed at the higher levels (Fig. 7.11). They argued that since behaviours of both sexes in terms of smoking, driving, working, etc. are now converging, in the same way, life expectancy should also converge. Soon after they published their tables, trends observed in many developed countries were exactly the opposite, especially in countries like Sweden or the U.S.

In fact, the period with increasing sex differences in life expectancy relates to the greater negative effects of smoking for men, but also that of greater benefits from the cardiovascular revolution for women. And, actually, Coale and Demeny were not so

Fig. 7.11 Relationship between the level of male life expectancy at birth and the difference between male and female life expectancy according to Coale and Demeny model life tables and three national historical experiences (up to the 1980s). Source Vallin (2002)

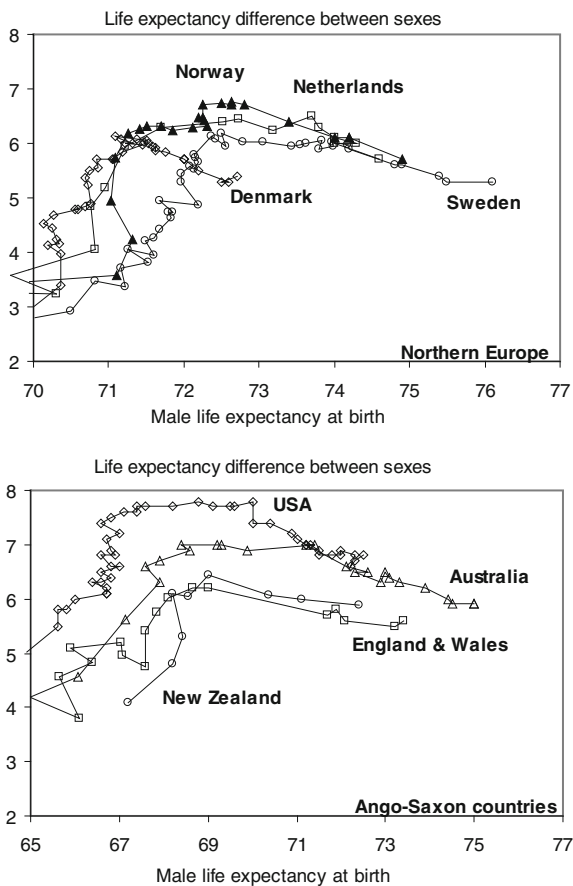


wrong, but only right too soon. As soon as the late 1960s in England and Wales, and more generally since the 1980s in other English-speaking countries and in European Nordic countries, male tobacco consumption started to fall while men increasingly copied healthy female behaviour in relation to cardiovascular diseases. Figure 7.12 shows the results in terms of sex gap/level of life expectancy trends.

Social Groups

Inequality in life expectancy by social group is one of the most unacceptable ones. Common sense tells us that even if economic differences between individuals in our capitalist world are unavoidable or even, for some economists, quite necessary, at least inequality in death should be eliminated. Indeed most developed countries have implemented policies to reduce them, not only by encouraging private insurance that aims to socialise the risks of having to pay for health, but also by

Fig. 7.12 Relationship between the level of life expectancy at birth and the difference between male and female life expectancy in some English-speaking and Northern European countries in the three last decades of the twentieth century. *Source* Vallin (2002)



setting up compulsory systems of social security, one of the masterpieces of the European “welfare state”. Especially, after Pasteur’s revolution, as medical science became more and more efficient in fighting infectious diseases, the leading cause of death at that time, the idea that it was possible to extend the full benefits of new medical techniques to the population as a whole became more and more popular. New policies were introduced aiming to reduce dramatically social inequality in health and life expectancy. Especially after World War II, not only in the Communist region but also in the West, all European countries established social health systems which, thanks to the spectacular success of antibiotics, offered great promise of future progress.

Half a century later, the hope of eliminating or even of gradually reducing social differences in life expectancy had vanished completely in the face of results like those illustrated in Fig. 7.13 for France, which compares recent trends in male life expectancy at age 35 among 7 broad socio-occupational groups to that of France as a whole. Unfortunately, only 3 points in time are available for social groups (1980, 1988 and 1996) but that is enough to be very pessimistic. Indeed, while the indicator increased dramatically at the national level (from about 35 years in 1955 to 43 in 2005) it also increased for each of the social categories, but the pace of increase was not faster for the lowest categories than for the highest. On the contrary, the social divide seems greater than ever, since life expectancy increased more rapidly for the highest groups (senior management and higher intellectual occupations) than for the lower ones. Consequently, while, in 1996, male life expectancy at age 35 of the lowest group (inactive people) was at the same level as the national one in 1810 (almost two hundred years before!), it is at the national level of 1980 for “manual workers”, and 1990 for “clerical workers”. Conversely, in the same year, 1996, the 2005 national level had been already reached by “self-employed” and “intermediate occupations”, and although we might expect the national level to reach the 1996 level of “agricultural occupations” quite soon, it is much less sure that the national level will reach the one observed for the highest occupational category in 1996 within a few decades.

7.3 What is the Explanation?

How can we explain such large differences in life expectancy among and within European countries that are, along with Japan and overseas English-speaking countries, the most advanced ones in terms of health and welfare systems, after more than one or two hundred years of tremendous medical, economic and social progress? This in itself is a big challenge. Is it possible to explain everything together? Certainly not, but let us try.

And, perhaps, let us do even more. Although this paper is devoted to Europe, it would be surprising if the case of Europe followed different rules than the rest of the world. Fortunately, Europe was the first to radically change the past traditional relationship that human beings had with their own health and length of life. For

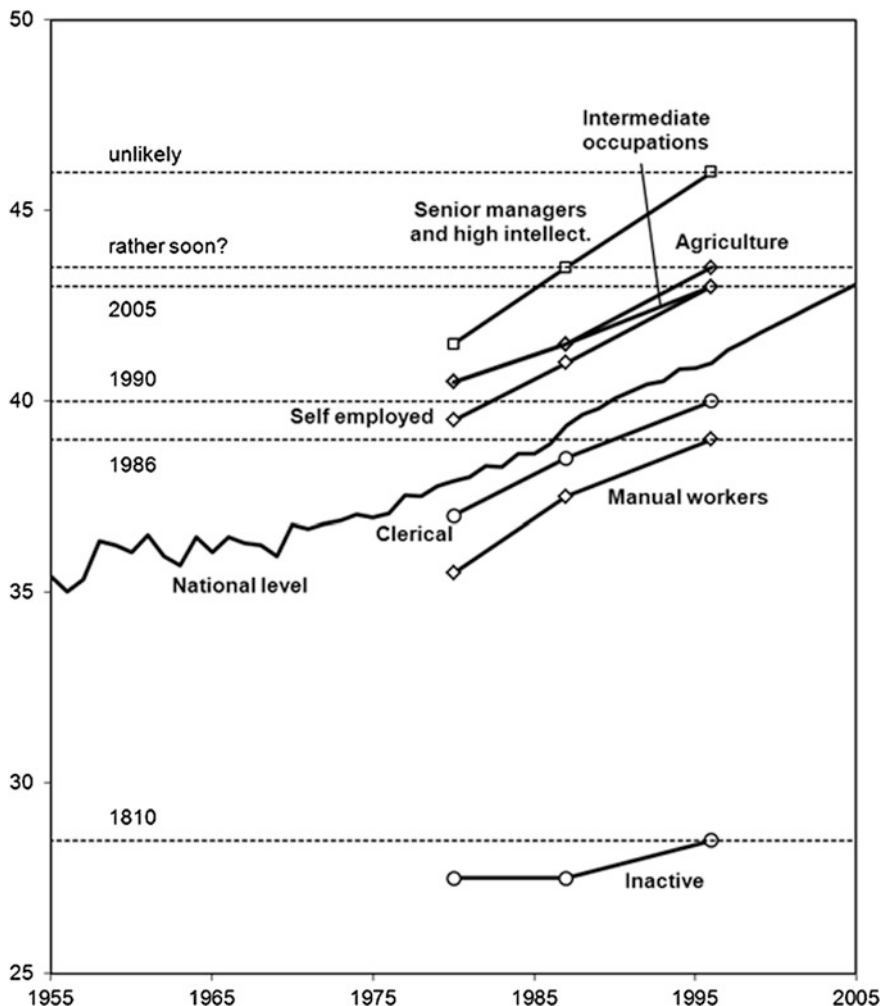


Fig. 7.13 Male life expectancy at age 35 by occupational groups, as compared to the national trend in France (1955–2005)

that reason, Europe is the main “laboratory” to test theories but we should not forget that any general explanation must take into account the whole story, including that of the developing world.

A basic idea can help us: *Different histories have resulted in the current diversity.* If that is true, then we can look at general theories aiming to explain historical trends, starting with Omran’s (1971; 1983) epidemiologic transition theory but also looking at the attempts to correct or to replace that theory after it failed to explain more recent developments, and finally summarising the more pragmatic ideas recently proposed by France Meslé and myself.

7.3.1 From Epidemiologic Transition to Health Transition

Omran (1971) was the first to explicitly propose a general paradigm to explain the historical mortality decline that was the first pillar of the demographic transition, opening the door to the need for fertility control. According to his so-called *epidemiologic transition theory* (Omran 1971), in the process of the industrial revolution and of socio-cultural modernization, any society moves from an initial “age” to a final one by crossing an intermediate stage where the epidemiologic transition takes place. Thus, all countries have experienced or will experience soon:

- First, the age of *pestilence and famine* characterized by a very high current mortality, often exacerbated by severe fluctuations due to epidemics and food shortages; under these conditions, long-term mean life expectancy barely reaches 30 years;
- Second, the age of *pandemics receding* when modern medicine vanquishes most infectious diseases, especially at young ages, resulting in a dramatic fall in infant and child mortality and in a doubling of life expectancy from around 30 to about 60 years;
- Third, the age of *degenerative diseases and man-made diseases* where the life expectancy increase slows down because the returns of continuing decline in infectious mortality become smaller and because modern societies produce “man-made diseases” like alcoholism, smoking, traffic accidents, etc. that develop very rapidly and tend to reduce life expectancy that very rarely exceeds 70 or 75 years.

In Omran’s view, this “end of the transition” was a strong reason to think that in a relatively short time, step by step, all the countries that have not yet approached such a probable limit for life expectancy will converge towards the maximum almost reached already by the most advanced ones.

Obviously, facts decided differently. On the one hand, as soon as Omran published his founding article, new progress in the field of the so-called “degenerative diseases” opened the door to a new life expectancy increase, while, step by step, modern societies proved capable of controlling man-made-disease epidemics. But on the other hand, in Europe, as we saw here above, Central and Eastern European Communist countries failed to exploit that new opportunity and were unable to interrupt the rise in man-made diseases. Even more striking, two decades later, the quasi eradication of infectious diseases promised by Omran was very abruptly challenged by the AIDS epidemics, especially in Africa.

Was it enough to expand Omran’s theory by adding new ages to include all these unexpected events in its explanatory framework? Olshansky and Ault (1986), for example, proposed to add the *age of delayed degenerative diseases* to take into account the cardiovascular revolution. To do so, almost at the same time, Rogers and Hackenberg (1987) called that step *the hybridic stage* to further highlight the

role of diseases related to behaviour and lifestyle. Later on, Olshansky et al. (1998) even suggested a “fifth age”, that of *re-emergence of infectious diseases* to take AIDS onboard, while Omran himself (1998) described a new *age of aspired quality of life with paradoxical longevity and persistent inequities*. Finally, in the same article, Omran added a “sixth age”, *towards equity and quality*, simply to fit with the WHO *Health for all* catchword. For sure, in the absence of common background making it possible to join up all the pieces of the puzzle, it was better to rethink the whole perspective, as other authors did, mainly in the 1990s.

One important change, proposed by Frenk et al. (1991) in the first issue of the new journal *Health Transition* founded by Jack Caldwell, was to replace the word *epidemiologic* by *health*, which is not a simple matter of semantics but aims to emphasize that the rise in life expectancy is not only related to a change in the distribution of pathologies due to epidemiological events but also to changes in social and behavioural factors and in the economic and political capacity of societies to react to epidemiological facts. The authors draw upon the health transition concept proposed 20 years before by Lerner (1973) to widen that of epidemiologic transition and propose to combine different levels of analysis: “systemic”, “societal” “institutional” and “individual”. No doubt that this point of view is crucial to understand the different and sometimes contradictory trends in life expectancy. However, the authors did not make any attempt to demonstrate their idea on the basis of empirical data.

A second interesting idea came from Horiuchi (1999) who suggests considering several successive epidemiologic transitions that modified the pathological structure of the population at the same time as society moved forward from one technological era to a new one. The paradigm is based on the idea that each great technological era, namely “hunting and gathering”, “agriculture”, “industry”, “high technology”, and “future”, is associated with a specific type of society and dominated by a major cause of death, respectively *violence, infection, cardiovascular diseases, cancers, and aging*. It is interesting to note that Horiuchi’s idea is rather close to the concept of pathocenosis proposed by the historian of medicine Grmek (1969), who considered periods of equilibrium between pathogenic agents and short transitions between one pathocenosis and the next. But the big difference is that modern epidemiologic or health transitions lead from a lower to a higher level of life expectancy, while the change from one historical pathocenosis to the next leaves the high level of mortality quite unchanged.

7.3.2 *Divergence–Convergence*

In a study co-authored by France Meslé and myself, we described a possible general explanation for the great diversity of levels and trends in life expectancy by giving greater importance to empirical data. It seems to us that the latter suggest a succession of divergence-convergence movements that take place at different times from population to population (Vallin and Meslé 2004; 2005).

Our research is based on two initial ideas:

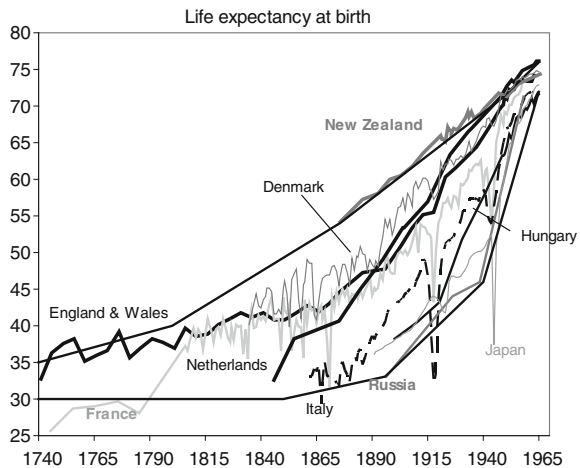
1. In the face of current heterogeneity, many studies have discussed the hope that a process of convergence towards the best life expectancy will occur. In our view, before speculating on convergence, it is important, first, to recognize that heterogeneity itself can result from a previous divergence process, and, second, to imagine what the cause of this divergence was.
2. Any major factor of improvement in life expectancy results in a phase of divergence, since some countries (or populations) are more ready to benefit from it than the others. However, after some time, those that lagged behind catch up with the pioneers in a convergence phase.

Let us look at history in the light of such ideas. At least two, but very likely three major movements of divergence-convergence quite obviously occurred or started within the two last centuries of human history. The first one corresponds quite well to what Omran called the epidemiologic transition: the control of infectious diseases. The second one is the cardiovascular revolution. The third could be the fight against old-age mortality. None of these three processes involved all the different countries (or populations) at the same time and nothing strictly requires that one process be completed before another one starts.

First Process: The Control of Infectious Diseases

Figure 7.14 displays life expectancy trends of a series of industrialized countries from the mid-eighteenth century to the mid-1960s. Not all the countries are represented to keep the drawing legible but this does not affect the general shape

Fig. 7.14 Long-term trends in female life expectancy for selected industrialized countries until the mid-1960s. Source Vallin and Meslé (2004)



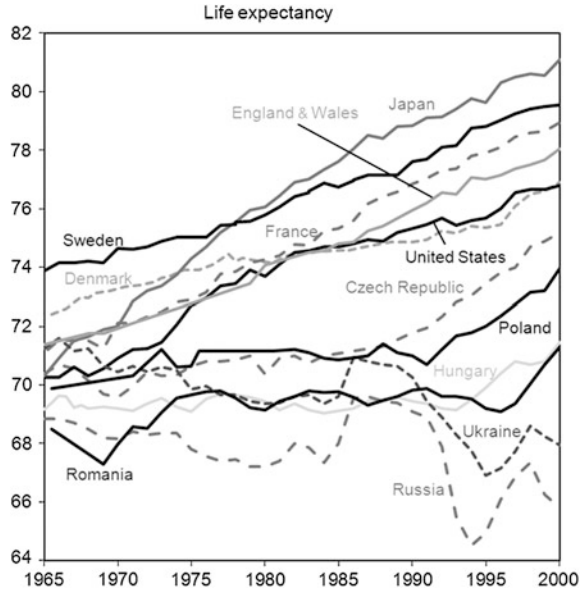
suggested. A strong convergence of trajectories appears clearly from the years 1880s to the mid-1960s, between New Zealand at the top and Russia and Japan at the bottom, with all other countries rather well spread in-between.

It is less easy to see the divergence that occurred before the convergence because of the lack of complete historical series but the two cases represented here, France and England and Wales, very probably, over-estimate the maximum and under-estimate the minimum prevailing in the second half of the eighteenth century.⁶ The interval between the two lines of Fig. 7.14 which were drawn to represent the upper and lower limits in between which the improvement of life expectancy in industrialized countries occurred thus gives a good idea of the complete process of divergence-convergence. A long discourse is not necessary to understand that such a movement is related to the industrialized countries' successful fight against infectious diseases. The basic scheme is rather well known: it is a continuum of changes in the fields of economics (from the agricultural progress of the mid-eighteenth century up to the industrial revolution), of medical technologies (from Jenner's vaccine to Pasteur's discoveries and to immunization, sulfamides and finally, antibiotics), and of social policies (from the generalization of education to the post-WWII social security systems). More interesting to note is that the timing of different countries' entry into that first movement of the health transition is linked to the timing of their modernization. England and Wales were the first, soon followed by France, the Nordic countries (here Denmark) and the Netherlands. Then the Mediterranean or Central European countries like Italy and Hungary started to catch up with the pioneers and finally Russia and Japan succeeded in doing the same, somewhat later but also much faster.

Without saying too much about developing countries that are not the focus of this paper, two things are important to underline. On the one hand, although they started to modernize later than the latest European countries, most of them are now (or will be very soon) catching up with the levels of life expectancy reached by the pioneers. They thus confirm that as soon as their economic and political situation enables them to benefit from rather simple and cheap technologies like immunization and antibiotics, they can also reduce infectious mortality dramatically. Many African countries, on the other hand, were so badly hit by the world economic crisis of the 1980s that they were unable to provide themselves with the basic conditions for doing so. Furthermore, those who were strongly affected by the AIDS epidemics experienced even more social and economic disruption and were totally unable to face the challenge. Consequently, life expectancy fell by 10, 15 or 20 years!

⁶ Both of them come from historical demography reconstruction but the English methods tended to underestimate the role of migration while the French one could have over-estimated infant mortality.

Fig. 7.15 Trends in life expectancy (both sexes) in industrialised countries since 1965. *Source* Vallin and Meslé (2004)



Second Process: The Cardiovascular Revolution

Contrary to the control of infectious diseases, the diverging trends caused by the cardiovascular revolution are striking (Fig. 7.15) while the converging ones are less so because the whole process is far from its end, even when the observation is limited to the industrialised world. Two main factors are responsible for the cardiovascular revolution: implementation of new technologies and behavioural changes. From a technological point of view, things are less simple than for infectious diseases. Here, progress can be attributed more to the rapid accumulation of a series of medical discoveries or improvements, from complex drug protocols to refined diagnosis techniques, advanced surgical procedures and sophisticated alert networks for rapid intervention. Active participation of the patients themselves is more important than for the fight against infection. But it is even more important for the necessary behaviour changes in terms of diet, exercise or medical screening for prevention, not to mention smoking and/or alcohol consumption.

In a first step, from the mid-1960s to the mid-1980s, the cardiovascular revolution almost immediately resulted in a strong divergence of life expectancy trends between a very steady increase in Western European countries (as well as in Japan and the U.S. of course) and a stagnation in the Central European countries under Communist regimes and even a deterioration in the Soviet Union (Fig. 7.15). In a second step, from the late 1980s or early 1990s, life expectancy started rising again in Central Europe. The pace observed in Poland and the Czech Republic suggests that these two countries could catch up with the U.S. or Denmark very soon and perhaps one day will reach the level of the most advanced pioneers (but this is probably another story as we shall see below).

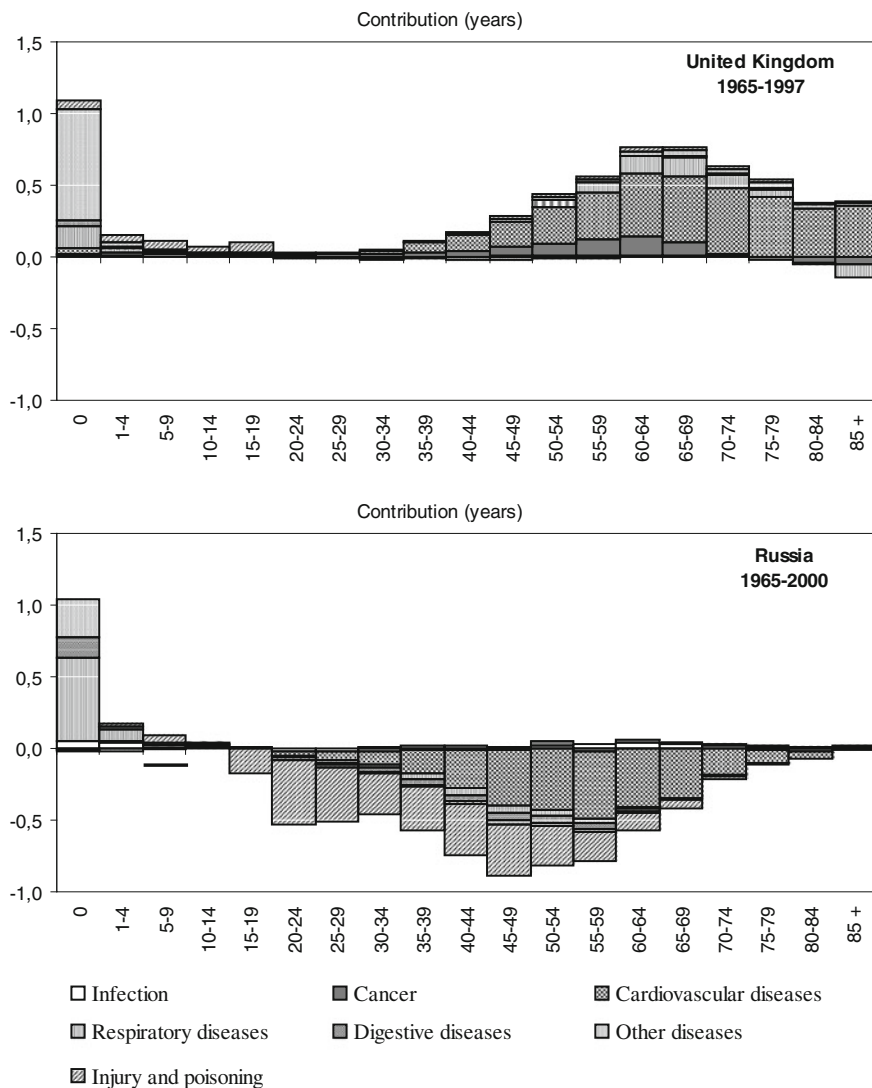


Fig. 7.16 Contribution of age-and-cause-specific mortality in male life expectancy changes since 1965, in the United Kingdom and Russia. *Source* Vallin and Meslé (2004)

The cardiovascular revolution is not the only cause of the divergence between East and West. Figure 7.16 shows the impact of age-and-cause-specific mortality changes on life expectancy changes since 1965 in the United Kingdom and Russia. The role played by cardiovascular mortality at adult ages is massive both for the UK life expectancy increase and for the Russian life expectancy decrease. But the latter is also due to the increase in external causes of death (including alcohol abuse and violence) at younger adult ages. Besides that, both countries made life

expectancy gains from a steady and substantial decrease in infant mortality that reinforces the life expectancy rise in the UK and moderates its decline in Russia.

Finally, Russia, and until the end of the 1980s, all Central and Eastern European countries, followed Omran's theory quite well: they had reached the "third age" where some decrease in infectious diseases is still possible but a substantial rise in life expectancy very improbable because of the pandemics of degenerative diseases and the spread of man-made diseases.

First, the former Communist countries were unable to benefit from the cardiovascular revolution for at least two reasons. Pushed by the Cold War to invest heavily in the military effort, they cut other budgets, including that of the health system, and were unable to provide access to new technologies to the whole population. At the same time, the necessary changes in individual behaviours were not really encouraged by a political context where people expected to receive everything from a central power that discourages any individual initiative. Second, these countries were also unable to stop the rise of man-made diseases, which often originated in habits that were more encouraged than discouraged by the political authorities.

It is more difficult to explain the reason why the life expectancy increase resumed in some of them (like Poland and the Czech Republic) but not in others (like Russia and Ukraine). The fact that the latter stayed longer under a Communist regime is not a sufficient explanation. More important is certainly the way these countries changed to a market economy. On the one side, Poland and the Czech Republic, had already attempted to change their economic and social system (with more or less success) well before the fall of the Berlin Wall and were better prepared for such a change, but they also transformed their economic and political system with less brutality and rapidly adopted positive institutional changes in the health system, whereas the Russian social and health services simply collapsed. Russia's transition towards a new and more efficient system will take more time.

Third Process? The Fight Against Old-Age Mortality

Although the cardiovascular revolution is not yet completed, it is quite possible to think of a third divergence-convergence movement when looking at female life expectancy in the most advanced countries. Women are much more advanced than men: Fig. 7.17 shows that in 2000, male life expectancy in the most advanced countries was not yet at the level already reached by women in 1980. If some new change were to appear, it would very likely be among females.

Indeed, the right-hand graph of Fig. 7.17 suggests that a new divergence process has started among women, between countries like Japan, France or Italy, where life expectancy increases steadily throughout the period, and some other countries like the U.S., Denmark, and the Netherlands, where it is slowing down.

Actually, recent life expectancy increases are largely driven by the mortality decline at old ages. Let us see what happened in life expectancy at age 65 in four of these countries, Japan, France, U.S. and the Netherlands. Figure 7.18 is quite

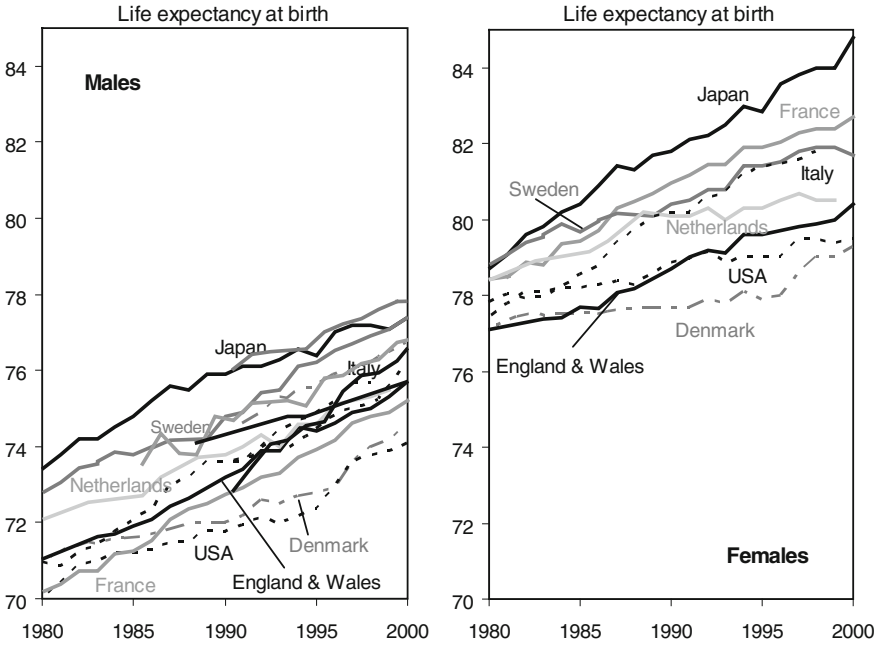
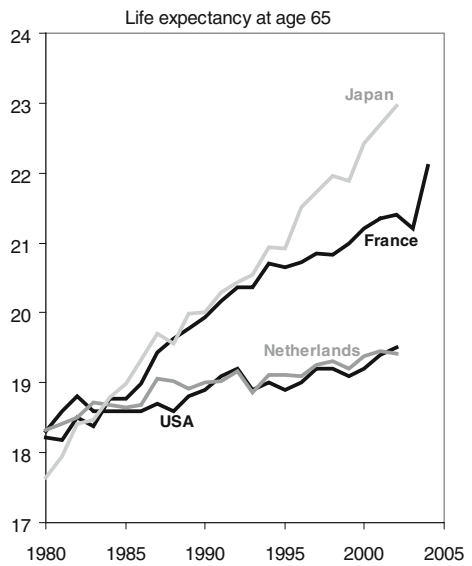


Fig. 7.17 Male and female life expectancy at birth in 8 industrialized countries, 1980–2000. *Source* Vallin and Meslé (2004)

Fig. 7.18 Female life expectancy at age 65 in 4 industrialized countries, 1980–2005. *Source* Meslé and Vallin (2006)



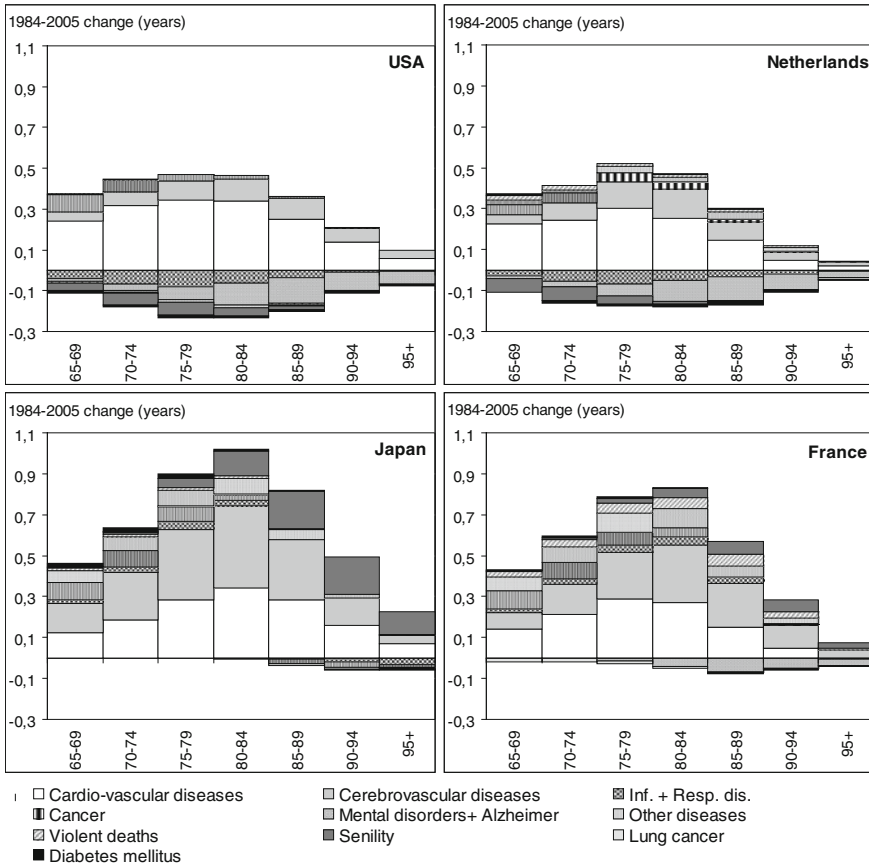


Fig. 7.19 Age and cause components of life expectancy changes 1984–2005: increasing weight of mental disorders in the U.S. and the Netherlands. *Source* Gleij et al. (2009); Meslé and Vallin (2006)

impressive: Japan and France on the one side, the U.S. and the Netherlands on the other, started to diverge dramatically from the early 1980s onwards.

Figure 7.19 displays the respective impact on life expectancy at age 65 of cause-and-age-specific mortality changes over the 1984–2005 period in each of the four countries. Gains in France and especially Japan are very impressive when compared to both, the U.S. and the Netherlands, where smaller gains are offset by sizeable losses. But the differential impact of causes by age is also remarkable.

First of all, whereas in France and Japan, very few age groups exhibit the negative effect of some causes, the impact of which is also very small, the U.S. and the Netherlands are hit by mortality increases for several causes across all age groups which accumulate into substantial losses. The greatest negative impact is due to mental disorders (including Alzheimer’s disease) while infectious and

respiratory diseases⁷ are the second source of losses, closely followed by lung cancer, which has virtually no effect in France and Japan.

The second difference between the U.S. and the Netherlands on the one hand, and France and Japan on the other, is that for the former two countries most gains are due to the decline of heart diseases, while France and Japan enjoyed greater declines in mortality from other diseases of the circulatory system.

Senility also makes an important contribution to gains in e_{65} for France and especially Japan, but not for the U.S. and the Netherlands because they rarely use this ICD code as an underlying cause. Senility is not a well-defined cause but redistributing it proportionately as generally done for the other ill-defined causes would mainly lead to a false perspective since, very probably, it is much more related to mental disorders than any other cause (Meslé 2006) or, perhaps, to cerebrovascular diseases. No doubt that an appropriate redistribution of senility would increase the already huge positive impact of “other circulatory diseases” in France and Japan, create a positive impact for mental disorders in Japan and change its negative effect into a positive one in France, while nothing would be changed in the U.S. and the Netherlands.

Furthermore, France and Japan differ substantially from the Netherlands and the U.S. in terms of the positive effects of other causes. Compared to the latter two countries, the former benefit from greater reductions in diabetes (especially Japan) and in causes that are here grouped as “other diseases”.

Thus, a new process of divergence seems to have started before the end of the cardiovascular revolution. Gains in the U.S. or Dutch life expectancy are almost exclusively due to cardiovascular mortality decline (especially heart diseases) and they are significantly eroded by losses due mainly to mental disorders. On the contrary, almost no losses affect France and Japan, where gains on cardiovascular diseases are more on cerebrovascular than heart conditions and much more concentrated in the very old ages, and where many other causes of death are sources of gains. Especially if French or Japanese senility can be largely assimilated to mental disorders, one could say that the United States and the Netherlands entered the rising pandemic of mental disorders foreseen by Kramer (1980) almost as soon as he published his article, while France and Japan had already found the way to escape it. More generally, a societal change could be responsible for this new process of divergence: the healthcare of the oldest people has improved substantially in France and Japan during the last two or three decades, perhaps not so much in the U.S. and the Netherlands. It has become less and less acceptable to let old people die without medical intervention. Such change has a technical basis, since medical intervention has become less and less aggressive. But it has also a cultural basis and probably some countries are more ready than others not only to use all medical technologies to gain additional years of life among old people, but also to pay enough attention to them in their daily life and to small health problems to keep them in good shape for longer. In France, the 2003 heat wave resulted in a

⁷ In fact, respiratory diseases account for most of the observed divergence.

paradoxical benefit: more lives were saved the year after than lost in 2003, just because the crisis obliged health services and society as a whole to see things differently.

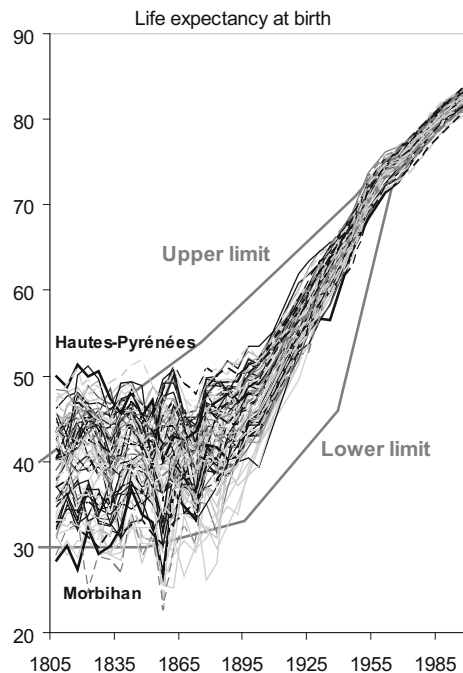
What About Sub-National Differences?

If the complexity of mortality trends becomes somewhat more understandable when considering these divergence-convergence processes caused by major advances in health, can such processes be helpful to interpret within-country mortality trends and differentials as well? In-depth exploration of this question is beyond the scope of this paper, but we will look briefly at selected examples of internal geographical variations, gender differentials, and social inequalities.

Geography

It is a matter of record that in the case of French *départements*, substantial convergence is observed across the nineteenth century (Caselli and Vallin 2006; Vallin 1990). In Fig. 7.20, female life expectancy trends by French *départements* are compared to the upper and lower limits of national trends in industrialised countries already plotted for Fig. 7.14.

Fig. 7.20 Trends in female life expectancy by French *départements* compared to the upper and lower limits of national trends in industrialised countries. Caselli and Vallin (2006)



At the beginning of the nineteenth century, notwithstanding the low national level of life expectancy (less than 40 years), the difference between *départements*' maximum and minimum values was more than 20 years throughout the first half of the nineteenth century, with a quite stable standard deviation of approximately 5 years. Unlike what was being seen between countries, no divergence appears in the early nineteenth century among French *départements*. It may well be that a divergence stage occurred before 1800, since the likelihood that some French *départements* always enjoyed life expectancy above 50 years is remote. However, it is also highly likely that, in the past, mortality differentials between small geographical units were much wider than international variations. Specific local hazards, in terms not only of climatic variation but also of economic and social environment, may have played a very important role. For example, the quality of drinking water and practices in disposal of liquid waste varied widely from place to place, and had a material impact on life expectancy. To begin with, therefore, there was probably greater heterogeneity within each country than between countries.

In the second half of the nineteenth century, by contrast, convergence between French *départements* is even more dramatic and rapid than it was between countries. This is probably the consequence of centralized economic, social and health policies that were very successful in spreading most benefits of health advances. It was an era of generalization of free trade on the domestic market, rapid expansion of transport networks (roads, railways) and development of food preservation techniques that raised food safety to near-equal levels nationwide. Likewise, public policies were implemented to develop drinking water supplies, sewerage systems and public hygiene up and down the country. Finally, the health advances brought by Pasteur's revolution, including the development of personal hygiene, were rapidly disseminated nationwide through the new education policy initiated by Jules Ferry, bringing in compulsory, free schooling.

In the second half of the twentieth century, and especially after the end of the 1960s, it might have been expected that the cardiovascular revolution would first result in a new divergence, as it had at the international level. Far from increasing, standard deviation for female life expectancy continues to decrease slightly from 1.1 in the 1950s to 0.7 in the 1990s. Internal geographical variations appear to have been relatively impervious to the dramatic change in French cardiovascular mortality. At that time, the major determinants of that mortality decrease were quite evenly distributed country-wide, thereby precluding any divergence. New health behaviours (diet, physical exercise, reducing alcohol consumption, etc.) spread across the country. Modern preventive medicine and treatments were well distributed among *départements*.

Indeed, an important difference appears here between national and local levels. At the national level, diverging processes are caused by the diversity of social, cultural, economic and political capacities to initiate new technologies and practices or to benefit from them. In a centralized state such as France, sub-national entities do not (or at least no longer) have enough political or cultural autonomy to react to health innovation at significantly different paces. It would be interesting to look at a federal state, like the U.S.

Gender Differentials

The left-hand side of Fig. 7.21 shows trends in absolute differences between male and female life expectancy in three Nordic countries and the Netherlands. The Swedish series are the longest, but the other three display very similar trends since the mid-nineteenth century. In Sweden, gender differentials first increased in the very early nineteenth century, decreasing thereafter to stabilise from the end of the nineteenth century up to World War II. Then came a fresh steady rise from the 1950s to the 1970s, followed by a renewed drop in the 1980s and 1990s. Can these wide fluctuations be interpreted in the same way as for the countries discussed above? It is clear that while improving their social status, women benefited increasingly from advances in the reduction of infectious diseases, especially at younger ages, but it is not so obvious to interpret men lagging and then catching up with women in terms of infectious diseases. The next wave underlines that delayed adoption of not only favourable but also unfavourable changes can contribute to a divergence-convergence process: from the 1950s to the 1980s, men lagged first because they were sooner and more massively affected by the rise in man-made diseases and second because women were more ready to benefit from the means to fight cardiovascular diseases. Trends in differentials dropped again in the early 1980s when man-made diseases came under control and men progressively adopted the new behaviours favourable to the reduction of cardiovascular diseases.

The same is true of Norway, Denmark, and the Netherlands, at least for the period covered by available data. On the right-hand part of Fig. 7.21, very similar trends appear for Anglo-Saxon countries (England and Wales, Australia, New Zealand, Canada and the U.S.) for the more recent wave of changes.

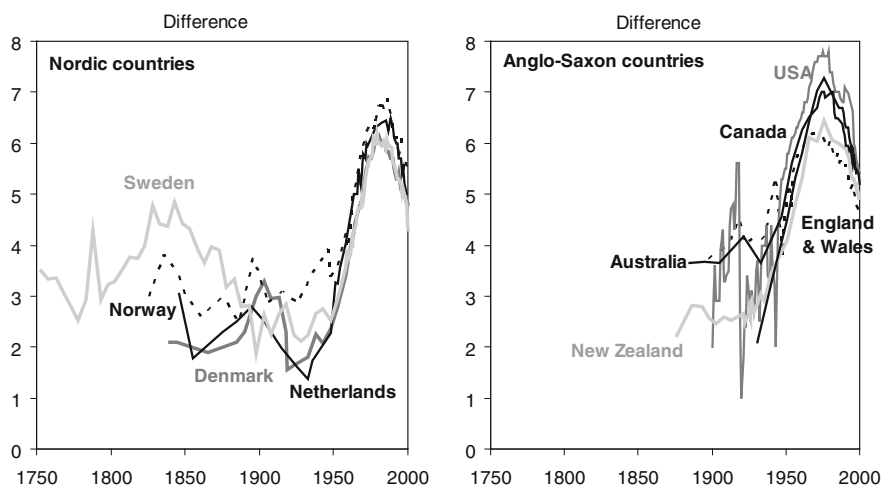
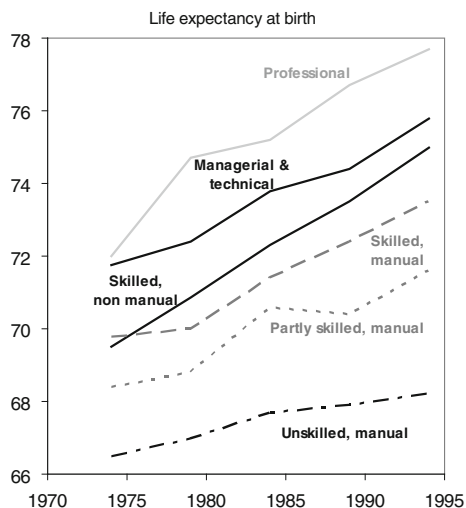


Fig. 7.21 Trends in the gap between male and female life expectancy in selected countries. Source Vallin and Meslé (2005)

Fig. 7.22 Male life expectancy at birth in England and Wales by socioeconomic category during the period 1972–1996. *Source* Valkonen (2001)



Social Classes

Although it would be much more complicated to attempt the same type of interpretation for socio-economic differentials, there is good reason to believe that life expectancy differences between social classes, levels of education and so on, could also have varied over time according to the ability to benefit from the different stages of the health transition.

Much of the difficulty here stems from the absence of long historical datasets and also from the poor comparability of existing data at different times.

However, for recent decades, especially the post-WWII period where data do exist for different countries, most studies show an increase in the social gradient of mortality, as assessed for Europe in an overview by Valkonen (2001). For England and Wales, for instance, regular series of social mortality surveys show clearly that life expectancy at birth increased for all social categories, but much more so for the higher than for the lower ones, resulting in a widening gap (Fig. 7.22). As Tapani Valkonen pointed out, “mortality from ischemic heart disease (IHD) was a major factor in the increase in mortality differentials among men aged 20 to 64. Mortality from IHD decreased by more than 50 % in Classes I and II from 1970/1972 to 1991/1993, but only 33 % in Class IV and 3 % in Class V.⁸ Changes in lung cancer, stroke, accidents, and suicide also contributed to the relative widening of the socio-economic mortality gap” (Valkonen 2001, 245). Some of the socio-economic differences in mortality are due to selection of socio-economic groups by individual health status (Fox et al. 1985; Valkonen 2001; Vallin 1979). But that

⁸ English studies distinguish 6 social classes : professional (I), managerial and technical (II), skilled non-manual (IIIN), skilled manual (IIIM), partly skilled manual (IV), and unskilled manual (V).

does not explain the widening of the gap. It is highly likely that the higher socio-economic categories were more able to take advantage of the cardiovascular revolution (either by adapting their behaviours or accessing the most sophisticated new medical technologies of screening and treatment), and to avoid man-made diseases as well.

7.4 Conclusion: A Rather Pessimistic View

After identifying three major divergence-convergence processes (corresponding respectively to the vanquishing of infectious diseases, the cardiovascular revolution, and finally the fight against old-age mortality) as three important features of historical life-expectancy trends, it becomes somewhat easier to understand the extreme diversity of levels, trends and patterns of mortality observed between and within countries. Both the current diversity and its sometimes paradoxical appearance are easier to understand, especially when considering that a new divergence-convergence process can start even if the previous one has not ended. This is true among entities (countries or sub-populations): the cardiovascular revolution started before most developing countries completed infectious disease control. But it is also true for a specific entity. For example, the cardiovascular revolution had not yet ended either in France or in Japan when these countries started to diverge from the U.S. or the Netherlands in terms of old-age mortality. Furthermore, one specific process can be interrupted if there is a reversal in the social, economic or political factors that allowed it to start. For example, African progress in the control of infection was held back by the 1980s world economic crisis and then severely eroded by the AIDS epidemics. It is no longer surprising that current inequalities in life expectancy are greater than ever.

What about the future? The three convergence-divergence processes identified here are not, by any means, an exhaustive list of all possible processes of this kind. It has been especially surprising to observe the beginning of a third transition in the field of mental diseases, when we might have expected the next challenge to come from cancers, which became the leading cause of death after the decline of cardiovascular diseases. No doubt that in the future, a more successful fight against cancer will generate a new divergence-convergence wave. And we can think of many other old or new pathologies as the next potential candidates. Furthermore, a completely new type of divergence-convergence could occur if the dream of lengthening the maximum human lifespan ever became a reality. No doubt that each of these possible innovations will open new doors to new divergences in favour of a few happy winners. Unless the whole process of health improvement finally reaches an impassable biological limit, we are likely to witness in the future new inequalities in health and life expectancy among countries and possibly within countries.

The only encouraging finding is that internal geographical differences can be reduced dramatically towards relatively sustainable homogeneity as the consequence of unified policies. But, even if international differences could be reduced

in the near future at the level of the European Union, or, much later, at a global level by a world government, it would be hardly the case for differences among socioeconomic categories and across other criteria that support the fundamentally non-egalitarian economic model that prevails today.

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