The sequentially divergent-convergent development of mortality

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ABSTRACT
This article aims to explore the convergence and divergence of mortality in different world regions along with factors influencing these developments. It identifies the most important deviations from global trends, explains their causes, and distinguishes world regions at risk of unfavorable demographic development resulting, for example, from excess male mortality or the failure to combat cardiovascular diseases. Finally, the article analyzes the divergent trends of mortality in the European post-socialist countries. The divergent-convergent development of mortality is understood as a sequential development, in contrast to traditional approaches, which study overall convergence and divergence trends, not their sequential course. Using the example of the development of the life expectancy at birth, the article shows that the phases of divergence and convergence are repeated.

KEYWORDS
mortality; sequentially divergent-convergent development; life expectancy at birth; post-socialist area

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1. Introduction

Convergence and divergence can be understood as processes in which certain trends come together or delay, whether it is in demography, economy, or sociology. The study of convergent and divergent tendencies of demographic behavior is still a current and relevant topic, which records the development both in terms of content depth and scope and in terms of methodology. This article is mainly of a theoretical nature and therefore focuses on selected theoretical concepts that are within the core of the field of demography and population development, and their relationship to convergent or divergent mortality trends. The aim is to map the origin of the approximation and delay of mortality rates and to illustrate the relationship between convergence/divergence and stages of population development, as it is summarized in the theory of demographic revolution and health transition. The relationship between these processes may seem one-time causal when we consider the demographic revolution and the health transition as the causes of convergence or divergence of mortality. However, this relationship is in fact sequentially divergent-convergent. In general, when there are certain changes in the population, such as improved hygiene conditions or a reduction in infant mortality, they spread gradually and manifest themselves in different parts of the globe at various intervals, which leads to a divergence in mortality. Eventually, these changes will be reflected in the rest of the world, leading to convergence (Vallin and Meslé 2004). However, over time, technological innovations and advances in health care will trigger a new divergence, and therefore there is a constant alternation of phases of divergence and convergence. This sequential approach to the study of convergence and divergence of mortality is still not quite common in the literature.

The analysis of convergent and divergent tendencies has yet another benefit. It offers the possibility to identify regions or countries that differ from general development, thus opening the door to further examination of the causes and consequences of these deviations. Usually, demographic development, at least since the beginning of the demographic revolution, is divergent-convergent, as discussed above. However, several times in history, we have seen that there are periods or regions in general convergence trends that show signs of growing diversity or internal heterogeneity due to uneven development. Some of these specific developments are also mentioned in the literature, such as the regions of Africa where divergent-convergent development has been disrupted by the HIV/AIDS epidemic, or the post-socialist area where it has been suspended by political and economic reforms (Horiuchi 1999).

It was in the latter area that demographic development was specific in many respects in the 20th century. Firstly, mortality in the post-socialist region declined at the beginning of the century, following the example of developed countries, but increased in the 1960s, which is not expected according to the classical theory of the demographic revolution. Second, the development was also unique in terms of birth rates because the level of this process in the second half of the 20th century dropped sharply to much lower values than the theory of the demographic revolution assumed. Last but not least, the post-socialist region deserves a more detailed analysis in terms of demographic behavior, also because development in individual countries is very heterogeneous and it is questionable whether convergence will eventually be achieved here as well.

The relevance of the topic is also clear in our current global situation with the COVID-19 pandemic, as the long-term observed and still-expected development of mortality was disrupted. However, we cannot claim that the current development contradicts the sequentially divergent-convergent development of this process, on the contrary. After all, the last stages of the epidemiological transition, which is presented in the theoretical chapter, presuppose the return or occurrence of new infectious diseases (Caselli et al. 2002). Therefore, it can be concluded that the processes of convergence and divergence of mortality are still not completed because there is a constant alternation of these phases.

This paper opens a discussion on the analysis of sequentially divergent-convergent development, in this case in the area of mortality, which will allow a more relevant assessment of the impacts of such phenomena or events. The aim of this article is not to study these specific events and their impacts, but to define a sequential approach in the context of key theoretical concepts describing general trends in demographic development and reproductive behavior. The partial goals and contributions of this article can be summarized in three points. First, putting the sequential development of mortality in the context of demographic theories and proving it by linking the theory of demographic revolution and health transition with the timing of divergent and convergent phases of mortality. Second, an illustration of the possible perception of sequential demographic development from a practical point of view, which means to be able to find deviations not from the assumption of linear and uniform convergence development, but from that sequential one. Third, the identification of key areas or regions that may be affected by this specific development and deviations from the sequentially divergent-convergent development of mortality. It is highly desirable to study these regions in detail, as their divergent development can have huge impacts, not only demographic but also social or economic.

As previously mentioned, there are several goals and questions worthy of analysis, which this article examines: What do convergence and divergence of mortality stem from? What are the exceptions to the

sequentially divergent-convergent development of mortality? What are the specifics of the post-socialist region in the period from the 19th century to the present?

The theoretical background of convergence and divergence of mortality is dealt with in the second chapter describing the basic principles of selected theoretical concepts. This is followed by a third chapter on the data, methods and selection of countries to be analyzed. The subsequent practical section then examines sequentially divergent-convergent development of mortality and shows that demographic theories naturally carry the assumption of convergent and divergent tendencies. The analysis also makes it possible to identify deviations and specifics of selected areas.

2. Theoretical background

2.1 Demographic revolution

The beginnings of demographic convergence and divergence are usually associated with demographic revolution (Chesnais 1986). In reality, they go much deeper into the past, and signs of converging and delaying demographic development can be seen, for example, in plague epidemics. These did not appear all over the world at the same time, but quite differently. Mortality increased in the areas affected, leading to global divergence. Subsequently, the plague spread to other areas, resulting in global convergence (Bergdolt 2002). However, due to the absence of data, it is very difficult to carry out a demographic analysis of these events. Such analysis is worthy of exploration, but is beyond the scope of this article and belongs more to the field of historical demographers or epidemiologists.

In the 20th century, demographic revolution ended in many countries, which can be considered one of the most important changes in modern history. "The demographic revolution could be described briefly as a revolutionary and in the entire history of mankind unique quantitative-qualitative transformation of the nature of the demographic pattern, which in its outcome is most marked in changes in the levels of fertility, mortality and the age structure of individual populations" (Pavlík 1980: 135). The primary feature of this transformation is the change in the demographic regime from a high level of mortality and fertility to relatively low values, which we distinguish in three basic phases. The first is characterized by a high mortality rate, about three to four times higher than in Europe today. Fertility also reaches high values, which at this stage range from 4.5 to 7.5 live births per woman (Coale 1974). The levels of both processes are almost balanced and, as a result, there is minimal population growth. During the second phase, there is first a reduction in mortality and then in fertility. The transformation of mortality is usually more significant and the result is considerable population growth. The third phase is characterized by low and stable mortality rates, which are being approached by the birth rates, and in response, the rate of population growth decreases (Rabušic 2001).

However, the course, pace, and intensity of this transformation vary from country to country. Similar to plague epidemics, demographic revolution around the world manifested itself at different times. The beginning dates back to the second half of the 18th century and among the pioneers are the countries of Europe. Here, the demographic revolution took place circa in 1750–1930 and began in France and England, then manifested in northern, southern, and eastern Europe, and later progressed through the United States and Australia to Japan. In developing countries, it began to take place much later – in the 20th century. First in Latin America, then in Asia, and finally in Africa, and in many countries it is still unfinished (Pavlík 2004). We can therefore say that demographic revolution is a universal process that is taking place gradually in all countries of the world. Initially, it is characterized by relatively homogeneous levels of both key processes. During the transition, heterogeneity then increases as individual states gradually go through the various stages of the demographic revolution, and therefore divergence occurs. At the end, both processes reach a low level and again there is a tendency for convergence between states and populations.

2.2 Health transition

One concept close to the demographic revolution is the health transition, which explains the development of mortality and morbidity and closely touches the topic of demographic convergence and divergence. In 1971, Abdel Omran (1971) defined an epidemiological transition that describes the development of health in developed countries in three phases from the 18th century to the 1960s. The first phase is called the age of pestilence and famine, during which the mortality rate is high and fluctuates. Infectious diseases are among the leading causes of death, and mortality crises caused by epidemics and famines emerge. Life expectancy at birth does not exceed 30 years, on average. The second phase is the age of receding pandemics, when there is a significant increase in life expectancy at birth to 50 years, mainly due to the remission of infectious diseases. The third phase corresponds to the age of degenerative and man-made diseases which are characterized by a slowdown in the decline in mortality, as the suppression of infectious diseases makes degenerative and civilizational diseases more visible (Vallin and Meslé 2004).

At the time when Omran was developing his theory, a convergence within developed countries did occur, as the incidence of infectious diseases had already been greatly reduced there. Even less-developed countries made significant progress and were

gradually gaining control of infectious diseases. In the 1960s, however, the increase in life expectancy at birth slowed down and in some countries even stagnated, especially due to the growing impact of man-made diseases caused by smoking or traffic accidents. Progress was also not expected in the causes of death, which at the time were thought to be chiefly associated with the inevitable degeneration in old age, such as cancer or cardiovascular diseases. However, the increase in mortality from man-made diseases has been suppressed by effective policies and, in particular, by the revolution in the treatment of cardiovascular diseases. In the 1970s, a new period of progress began due to the cardiovascular revolution, which quickly appeared in developed countries. In response, mortality in adult and older ages began to decline again, especially from diseases of the circulatory system (Caselli et al. 2002). However, Omran could not have expected this development, as he based the formulation of the epidemiological transition only on the knowledge acquired before the 1960s, and therefore considered the third phase of the transition to be the last. Thus, Omran's theory soon became unsustainable, and considerations about the next stages of the epidemiological transition began to emerge gradually in connection with the cardiovascular revolution and the spread of HIV/AIDS. Finally, in 1991, Frenk et al. (1991) proposed to replace the epidemiological transition with a broader concept of health transition, which includes not only the development of epidemiological characteristics but also the policies and strategies of individual societies (Caselli 1995; Meslé and Vallin 2000). The first stage of this health transition is usually identified with the entire epidemiological transition and is generally considered to last until the end of the 1960s. The second phase then begins with the cardiovascular revolution, and the beginning of the third phase dates to the 1990s and is associated with successes in reducing the diseases of old age (Vallin and Meslé 2004).

Similar to the demographic revolution, the health transition did not take place simultaneously around the globe. For example, the second stage of the epidemiological transition began in the 18th century in northwestern Europe and gradually spread through southern and eastern Europe, where it was seen in the 20th century. In the case of the health transition, we can observe recurring divergent-convergent tendencies, because each significant improvement in mortality first leads to a divergence of populations, but after a certain time, there is a re-convergence. Until the 1960s, indeed, there was largely global convergence. Subsequently, however, dramatic exceptions to the general trend of increasing life expectancy at birth began to emerge. On the one hand, there were nations and regions, especially in Eastern Europe, that did not have enough resources to start a cardiovascular revolution. On the other hand, some countries still did not complete the second period of epidemiological transition, and in this situation, they were severely affected by epidemics such as AIDS (Caselli et al. 2002). Since the turn of the millennium, we can observe a new convergence, as lagging countries gradually catch up with pioneering states.

3. Data and methods

Long-term data are needed to capture the relationship between demographic theories related to the study of divergence and convergence of mortality and the stages of population development. In addition, in order to identify regions or countries that diverge or show a specific course, it is necessary to compare the situation on a global scale. For this reason, Gapminder is used as a main source of data for initial comparison as it provides data and estimates on life expectancy at birth for 197 countries in the period 1800–2100. This huge database is based on multiple sources, mainly data from the Institute of Health Metrics and Evaluation in their Global Burden Disease Studies (GBD 2019), World Population Prospects 2019, and Gapminder-Life expectancy v. 7 which is based on 100 sources (Gapminder). The second source of data used in this paper is the World Population Prospects 2019 (United Nations 2019), specifically the Life expectancy at birth for both sexes combined for the countries of the post-socialist region.

In terms of country selection, several representatives were chosen for each region of the world to represent area-specific development. The length of the time series for which data is available for a given country was also taken into account. Therefore, in Figure 1 we can see representatives of Western, Northern and Southern Europe (United Kingdom, France, the Netherlands, Sweden, Italy), Central Europe (Czechia and Hungary), Eastern Europe (Russia), developed non-European economies (Japan, United States, Australia), Latin America (Mexico), Asia (China and India) and Africa (Nigeria). Given the specific development of the post-socialist region, Figure 3 then shows selected countries in this area.

To analyze the pace and timing of the demographic revolution and the health transition, the basic indicator of mortality, life expectancy at birth, is used. Its advantage is that it makes it possible to easily and comprehensibly compare the development of mortality in the world and identify divergent and convergent tendencies. On the other hand, this indicator needs to be seen as a limit of research as well because it is a comprehensive indicator that hides specific mortality patterns (Borges 2018). Although, it does not allow a more detailed analysis, for example in terms of age or causes of death, it can be considered as a good indicator for creating an overall view, for basic international comparisons and also for finding specifics requiring a more detailed analysis, which is also one of the aims of the text.

The divergent-convergent development of mortality can also be indicated by the variation range, in this case the variation range of life expectancy at birth, which is calculated as the difference between the maximum and minimum value of the indicator.

4. Sequentially divergent-convergent development of mortality

In the light of the previous theoretical introduction, we can describe the development of mortality in the modern era as sequentially divergent-convergent since divergent-convergent cycles are still alternating. The following graph (Fig. 1) shows the development of life expectancy at birth in selected countries of the world, which represent geographical regions and the course typical for them. Due to the insufficient database for the older period, we can observe the development from the beginning of the 19th century to 2015 in the graph, with the number of analyzed countries increasing over time due to better data collection. At the beginning of the observed interval, we can compare only countries where statistics were already advanced in 1800. Not coincidentally, these are the pioneers where the demographic revolution first manifested itself.

Looking at life expectancy at birth in the countries shown in 1800 (United Kingdom, France, and Sweden), it is clear that the values of the indicator are in the range of 30–40 years (Fig. 1). This means that the demographic revolution was already in the process here, as before its start, life expectancy at birth ranges on average between 25–30 years. At the beginning of the reporting period, the level of the indicator was highest in the United Kingdom, where mortality conditions were better than in France, even though the demographic revolution began in the latter country. In the countries of southern and eastern Europe, we can see progress in mortality much later. For example, in Italy, a steady increase in life expectancy at birth began only around the 1870s, and in Hungary or Czechia (i.e. in Eastern European countries) only at the end of the 19th century. The beginning of the improvement in mortality was even later in Russia, where, in addition, there were significant fluctuations in life expectancy at birth. As for non-European developed countries, the demographic revolution spread here since the end of the 19th century. Data for Australia and the United States are available only from the 1870s and 1880s, respectively, but in both cases, we can observe a sharp and linear upward trend. It can therefore be assumed that these countries are among the pioneers, as the data show that both countries were far ahead of others and enjoyed a high life expectancy at birth for a long time (Oeppen and Vaupel 2002). A special case is Japan, which today is one of the most developed countries in the world, but it experienced a steady and significant increase in life expectancy at birth only at the end of the 19th century, much later than other industrialized countries.

In general, we can say that in developed countries the improvement in mortality began at different times

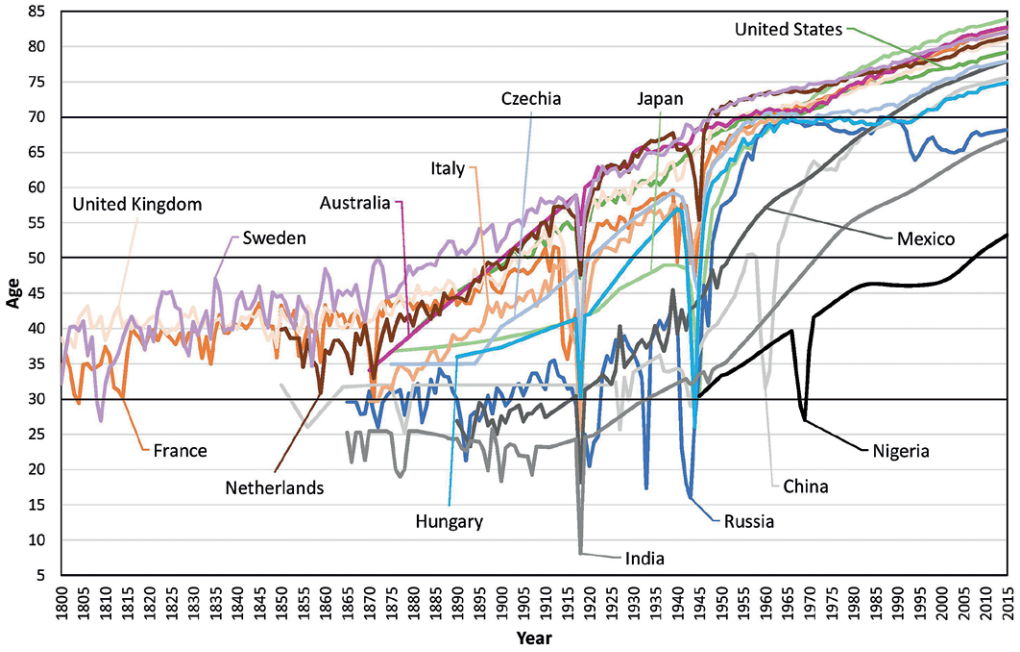

Fig. 1 Life expectancy at birth, both sexes, selected countries of the world, 1800–2015.
Source: Gapminder
Comment: The lower line at the age of 30 roughly defines the beginning of the demographic revolution and at the same time the transition between the first and second phases of the epidemiological transition. The middle line at the age of 50 indicates the break between the second and third phases. The upper line at the age of 70 marks the end of the demographic revolution.

between the end of the 18th century and the beginning of the 20th century, depending on the economic, social, and political context (Vallin and Meslé 2004). It is also important to note that in countries that began a steady increase in life expectancy at birth later, the pace of progress was faster than in pioneering countries. For this reason, we can first observe (Fig. 1) a divergent tendency, which was replaced in the second half of the 20th century by convergence, when all analyzed countries approached life expectancy at birth at the level of 70 years. In developed countries, maximum convergence was achieved in the 1960s. The divergent-convergent development is also indicated by the variation range of values of life expectancy at birth (Fig. 2). At the beginning of the observed period (1800), the indicator in developed countries[1] reached the value of 6.49, but due to the absence of data for most countries, this level cannot be reliably compared with other years. In 1890, we can already calculate the range from all industrialized countries, reaching the value of 20.55. The increase in the indicator is even more noticeable in the following years and the maximum of 50.97 was reached in 1942. Subsequently, the range began to decrease and reached its local minimum of 4.25 in 1964.

The first graph also shows that the development was very different in developing countries. Although data are available only for a later period, it is nevertheless clear that a permanent increase in life expectancy at birth did not occur in these regions until the 20th century: first around 1915 in Mexico, then approximately 1920 in India, 1925 in China, and finally around 1940 in Nigeria. Thus, the demographic revolution had really spread in developing countries from Latin America through Asia to Africa. These countries exceeded the aforementioned limit of life expectancy at birth of 30 years during the first half of the 20th century. However, many countries, especially in Asia and Africa, even today have not yet reached the level of 70 years associated with the end of the demographic revolution.

When we look at the development of life expectancy at birth from the point of view of the health transition (Fig. 1), we can see when countries, and therefore regions of the world, moved from one stage to another. When analyzing the health transition, the diversification of causes of death is crucial, however, the levels of life expectancy at birth, which were defined by Omran, can also be used for the basic definition of stages. In the first phase of the epidemiological transition, the average life expectancy at birth is less than 30 years, and in the second period, there is a significant increase of the indicator to 50 years. Subsequently, countries enter the third phase, when the rate of increase in life expectancy at birth slows down (Vallin and Meslé 2004).

At the beginning of the reporting period, this indicator of mortality level exceeded 30 years in France, England, and Sweden, which means that these countries have already entered the second phase of the epidemiological transition. In the second half of the 19th century, this limit was exceeded in Italy and at the end of the century in Russia. We can therefore say that developed countries entered the second phase of the epidemiological transition, with different timing, during the 18th and 19th centuries. On the contrary, developing countries did not end the first period until the first half of the 20th century. As for the transition from the second phase to the third, this occurred in northern Europe (represented here by Sweden) first, during the 1880s. Then it occurred at the turn of the century in Western Europe (the Netherlands, the United Kingdom, and France), in the 1920s in southern (Italy) and central (Czechia and Hungary) Europe, and finally prior to 1950 in Russia. As for non-European countries, the limit of life expectancy at birth of 50 years was exceeded in the United States and Australia, as in Western Europe, at the turn of the 19th and 20th centuries, while in Japan the third phase of the epidemiological transition began only after World War II. In Latin America (Mexico), the second period ended in the early second half of the 20th century, in Asia (China and India) in the 1960s and 1970s, and in Africa (Nigeria) not until the 21st century.

As mentioned above, the three stages of the epidemiological transition can be included in the first phase of the health transition, which in developed countries ended around the 1960s. At that time, the increase in life expectancy at birth slowed down significantly and often even stopped, and at the same time, the maximum convergence of life expectancy occurred in this decade. The cardiovascular revolution then started a new phase of the improvement of mortality conditions and the second phase of the health transition, simultaneously. However, it did not occur around the world all at once, which led to a divergent development of the indicator. The cardiovascular revolution first manifested itself in the 1970s in developed countries, except for Eastern Europe where it began late in the 1990s. This differing development is also evident in the first graph, where we can observe a renewed increase in life expectancy in Northern, Western, and Southern Europe since the 1970s, as well as in Australia, the United States, and Japan. By contrast, in Eastern Europe, mortality rates began to stagnate or even decline in the late 1960s. In Central Europe (Czechia and Hungary), the rise was resumed in the 1980s and 1990s, respectively, while in Russia mortality rates began to improve steadily only at the beginning of the 21st century. For this reason, we can observe a divergent development in Europe since the 1970s, which was replaced by convergence at the beginning of the 21st century.

1 Among the developed countries are the United States, Japan, France, Russia, the United Kingdom, Italy, Australia, the Netherlands, Sweden, Czechia, and Hungary.

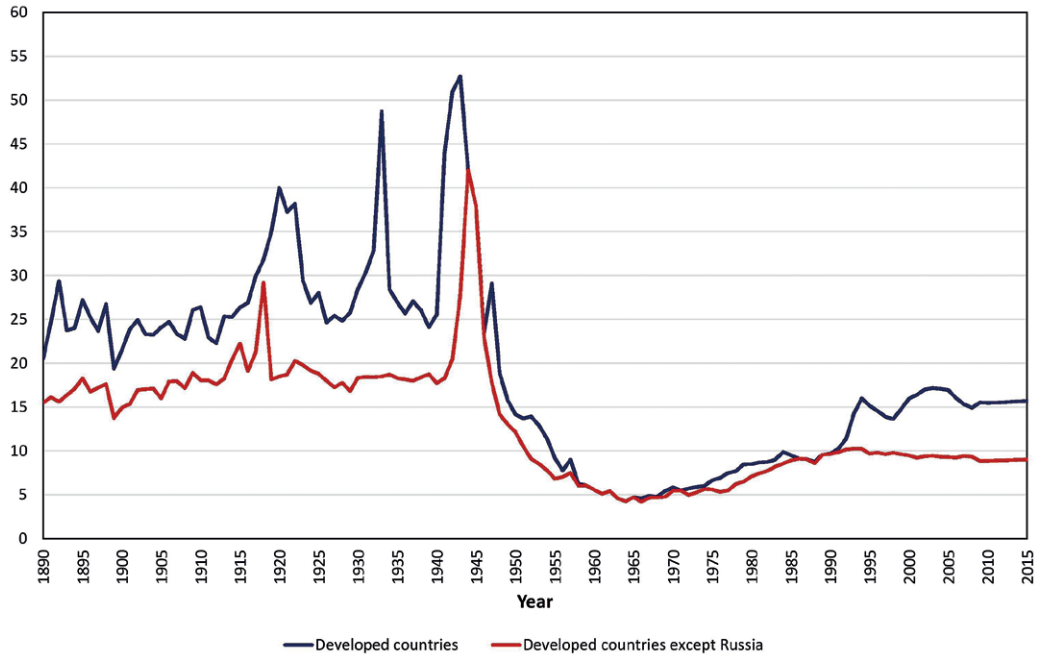

Fig. 2 Variation range of life expectancy at birth, developed countries, 1890–2015.
Source: Gapminder
Comment: The group of developed countries includes the United States, Japan, France, Russia, the United Kingdom, Italy, Australia, the Netherlands, Sweden, Czechia, and Hungary.

However, it is clear that in 2015 the variation range was much larger than in the 1960s, when the local minimum of 4.25 was reached in developed countries (Fig. 2). Subsequently, the value of the indicator increased until 2003, when the local maximum of 17.15 was reached. Since then, the range has decreased until 2010, when it was 15.47 and then increased slightly. The first graph shows that Russia differs significantly from other developed countries in its development and demonstrates a wider range. If we exclude this outlier from the calculation, the indicator reaches much lower values. Nevertheless, we can observe a similar development since 1964 when excluding Russia – the difference in life expectancy at birth grew until 1993 when it was 10.25 years. It then decreased until 2009, when it reached a local minimum of 8.85 and has been rising slightly since then (see Fig. 2). On that basis, we can conclude that some developed countries, especially in Eastern Europe, are lagging in increasing life expectancy at birth.

Turning our attention to developing countries (Fig. 1), we can see that in 2015 Mexico and China achieved similar levels of life expectancy at birth as Central European countries. This means that they have entered the second phase of the health transition, and in this case, we can talk about a convergence of mortality. However, other developing countries have not yet completed the first phase of the health transition, although India is gradually approaching the pace of developed countries. In Africa, the development of mortality is significantly delayed, because the African continent, especially the countries of sub-Saharan Africa, was affected by the HIV/AIDS epidemic just as it entered the second phase of the epidemiological transition. At that time, there should be a significant increase in life expectancy at birth, and this positive development was interrupted by the epidemic. The increase in life expectancy at birth was resumed here at the turn of the millennium, but the level of the indicator still remains very low (in 2015, the average life expectancy at birth in Nigeria was 53.3 years). Therefore, it cannot be said that developing countries are significantly getting closer to developed countries.

Based on the above-mentioned facts and analysis, we can indeed call the development of morality sequentially divergent-convergent. Furthermore, we can identify three groups of countries. The first one consists of developed countries, where divergence took place, especially at the beginning of the 20th century, and was replaced in the 1960s by convergence, which continues with some minor variation today. The second group includes developing countries, where the variation range began to increase from the 1930s, and only from the beginning of the 21st century can we observe a slight decrease in the indicator. This means that divergence dominated in this region during the analyzed period and there is no significant convergence even today. The third group is made up of Eastern European countries, which show a specific course that differs from the traditional development of mortality. Life expectancy at birth has been increasing rapidly since the beginning of the 20th century, as

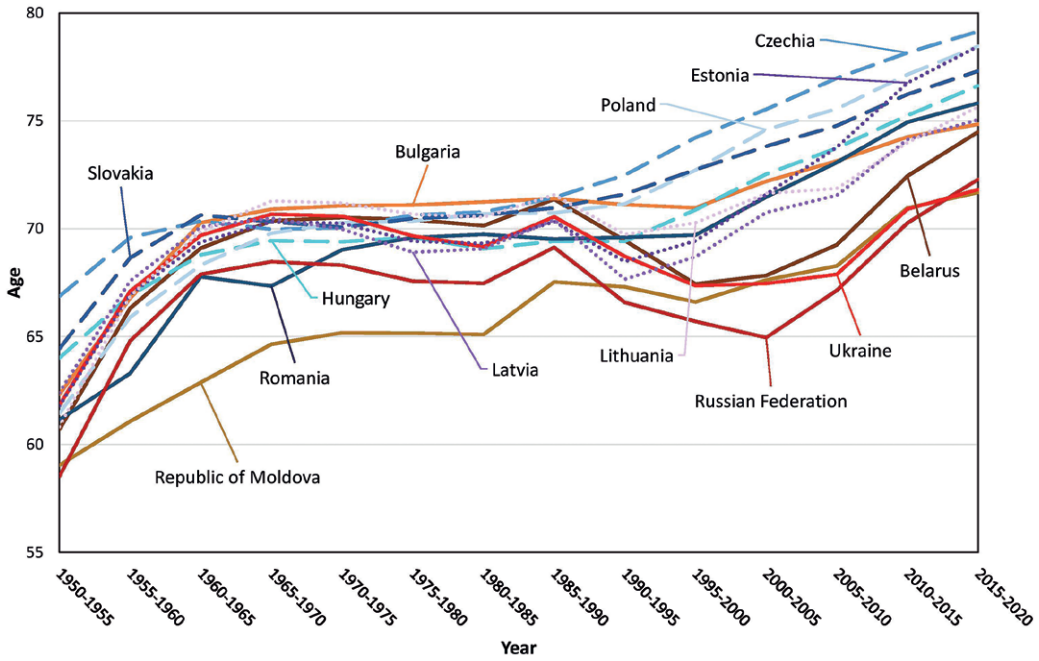

Fig. 3 Life expectancy at birth, both sexes, selected countries of post-socialist region, 1950–2020.
Source: United Nations, 2019

in other countries. At the end of the 1960s, however, growth stopped and even mortality rates dropped, not in response to political unrest or an epidemic, as is the case of Africa.

The post-socialist region, therefore, deserves more detailed analysis, mainly for two reasons. First, it deviates significantly from the development in developed countries, and second, we can observe heterogeneous development within the region. Based on the following graph (Fig. 3), it can be stated that from the middle of the 20th century, life expectancy at birth in the post-socialist area converged until about 1985, when the variation range reached the lowest value of 4.04. Maximum convergence compared to developed countries occurred later, due to the delayed cardiovascular revolution, as mentioned above. Subsequently, however, the indicator showed a markedly divergent trend, as mortality rates developed differently in subregions. The most significant improvement occurred in Central Europe (dashed curve in Fig. 3), with progress first seen in Czechia, then in Slovakia, Poland, and finally in Hungary. In the Baltic States (dotted curve in Fig. 3), life expectancy at birth first decreased and began to increase again from the 1990s, especially in Estonia. In Eastern Europe (the continuous curve in Fig. 3), the decline of the indicator was greater and the reverse did not occur until the turn of the millennium when the variation range in post-socialist region reached a maximum of 10.58 (see Fig. 3). Since then, we can observe a new phase of convergence here, and it can be assumed that the heterogeneous trend of the second half of the 20th century will be replaced by convergence.

5. Conclusion

The analysis of mortality using the development of life expectancy at birth confirms theoretical concepts according to which demographic development is sequentially divergent-convergent. Changes in health, economics, or politics are reflected individually in regions or states in terms of pace and intensity. For this reason, global divergence always occurs first, which is then replaced by convergence. Since new technologies and improvement of health care supervene at different time intervals, new phases of divergence and convergence of mortality are constantly emerging.

Sequentially divergent-convergent development of mortality is evident from the development of life expectancy at birth and variation range – indeed we can first observe global divergence, which was replaced by global convergence after World War II. After 1965, divergent tendencies reappeared, as regions of the world experienced different developments, not only demographic but also economic or political. After a short period of stagnation, developed countries have re-entered the path of progress, while the post-socialist area has faced an economic and social crisis, which has halted the improvement in mortality rates. In developing countries, life expectancy at birth was much lower due to delayed epidemiological transition and the HIV/AIDS epidemic. However, since the turn of the millennium, we can again speak of global convergence, as life expectancy at birth is increasing in all regions and levels are slowly converging. In general, therefore, we can say

that demographic development is sequentially divergent-convergent, where the phases of divergence and convergence gradually alternate and this process is still not complete.

The COVID-19 pandemic, which can be understood as the beginning of another divergence, also fits into this scenario. It began to appear gradually in regions of the world, with some affected more severely, others less so. Likewise, medical knowledge and measures have succeeded in reducing the incidence and mortality with COVID-19 over time, and we can hope for early convergence at a low mortality rate.

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