The health transition and an ageing society – example of selected European countries

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Abstract

Population ageing is a natural and inevitable process in each country with a highly developed economy. Countries from the western part of Europe have been struggling with this challenge from a long time. Countries from eastern and central Europe have been preparing for this challenge in the last few decades. In most of the European countries over 20% of people are over age 60. According to national statistical offices projections by three decades this ratio is going to double. Such an age structure of population has serious economic and social consequences – for pension system and health protection above all. Changes in mortality and disease profiles in conjunction with progress in health and socio-economic development allow for analysis of an epidemiological transition, and in broader notion – health transition. The aim of this article is to analyze the health status and mortality causes among people aged 65 years and over in selected European countries that are in different stages of health transition. In the article selected health measure and method of decomposing differences in expected life expectancy are used.

1   Introduction

We are observing an increase in the share of people older people in relation to the general population in Europe, so the discussion on demographic, epidemiological and health transition is extremely timely and necessary. The demographic transition is said in the situation of the transition of society from a high to a low reproduction rate and from a high to a low mortality rate. The demographic transition is accompanied by an epidemiological transition, which led to a change in the distribution of causes of death (more often we deal with degenerative diseases than infectious diseases) and an increase in mortality in later life. However, the health transition is related to the improvement of medical care (its effectiveness, change of orientation - from treatment to prevention), lifestyle change and positive economic

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and social changes resulting in longer life span, but more importantly - life expectancy in health.

An aging society is a challenge for European economies. The aging population will have financial consequences for the public finance system in the form of an increase in healthcare costs and care for older people. What is needed is an innovative approach and modern models of health care, including a departure from a hospital-based system for integrated healthcare, support for the evaluation of health technologies and a more effective use of online solutions. This is why analyzes and empirical studies are important, indicating trends in mortality, its causes and diseases most often affecting the society.

Analysis of the health transition process allows to answers the questions related primarily to the health of older people. Particularly interesting is the answer the question: does life expectancy go hand in hand with a longer and longer life in health and shorten the years lived with functional limitations caused by poor health, or does it entail extending the life span with diseases and disability? Due to the high degree of complexity and difficulty of the problems at work, selected aspects of the health transition process are presented. The theoretical part describes the health transition model. The empirical part focuses on the diagnosis of the current state and changes in the mortality and health status of older people over the past 26 years (1990-2016) in three European countries. The main aim of the study is to analyze the health status and causes of mortality in people aged 70 and above in relation to one of the theory of health transition - the general theory of aging.

2   Model of health transition

The general model of health transition was proposed by WHO in 1984, which presents the relationship between mortality and broadly understood morbidity and disability is called the general model of health transition (Fig. 1). The upper line "mortality" represents the survival curve that determines the fraction of people in the surviving population in a given age. The "disability" curve represents the percentage of people of a given age with no disability or unproductive disease. The field below the "morbidity" curve represents the time of life in good health, i.e. free of chronic diseases. The distance between the lines of morbidity and mortality is a "health gap" and is the difference between the actual state of health in the population and the state determined as perfect or full, in which everyone would live to death without serious diseases and disabilities. The area above the survival curve is the loss resulting from premature mortality and mortality before reaching the age considered optimal or maximum for a given population. In the literature there are several theories describing the

possible relations between health and disability curves and the survival curve occurring during the period of rapid increase in life expectancy and the aging of the population.
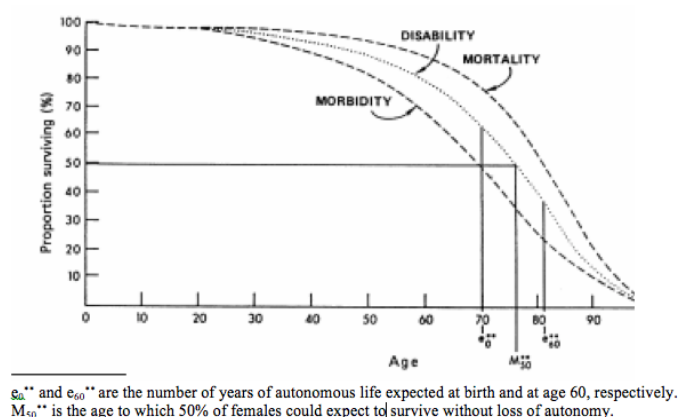

e_0^{**} and e_{60}^{**} are the number of years of autonomous life expected at birth and at age 60, respectively.
M_{50}^{**} is the age to which 50% of females could expect to survive without loss of autonomy.

Fig. 1 The general model of health transition (Jagger and Reyes-Beaman, 2003).

Three basic theories of health transition are known in the literature: compression of morbidity (1980), expansion of morbidity (1979), dynamic equilibrium theory (1982), and a new approach called the general theory of aging of the population (2005). The last one is the subject of interest from the perspective of this article.

The authors of this theory (Michel and Robine, 2004) emphasize that in order to understand the ongoing relationship between the course of mortality trends and changes in disability and disease burden, it is necessary to take into account the stage of demographic and epidemiological transition where a country is located, as well as socio-economic, geographical, cultural and medical conditions, which determine the stage of advancement of the aging process in connection with the health condition. The basis for the theory of aging of the population is the assumption of cyclic successive stages, the components of which are processes included in the model of health transition.

The first stage concerns the increase in the life expectancy due to the decrease in mortality in the oldest age groups. The increase in the survival of people at an advanced age burdened with various diseases and ailments results in an increase in the number of years lived with disability and the share of people in the population who are burdened with chronic diseases (expansion of morbidity). The second stage corresponds to the theory of dynamic equilibrium. It is associated with further medical progress, which allows to stop or slow down the development of many diseases and delay the occurrence of severe symptoms of the disease. The third stage (compression of morbidity) occurs as a result of entering the aging process of the next generation. It is assumed that people from this cohort, thanks to pro-healthy

behaviors and increasingly better living conditions, will enjoy better health compared to the previous generation. The authors suppose that the process may be continued and after the completion of one cycle, the first stage will be re-performed, albeit with a different quality.

According to this theory, in the 1970s and 1980s the Western countries entered the second phase, which was largely due to progress in cardiology. This progress allowed for the treatment of many diseases of the circulatory system, which not only increased the chances of survival, but also reduced the extent of the occurrence of more severe disabilities. An important element of this stage is adaptation to the existing demographic and epidemiological changes in health policy activities, which was directed to the growing population of elderly people and diseases typical of this age.

3   Assessment of health status of population

Health measures are required in an assessment of the health status of the population. Summary measures of population health are measures that combine information on mortality and non-fatal health outcomes to represent the health of a particular population as a single number.

Over the last decades, several indicators have been developed to adjust mortality to reflect the impact of morbidity or disability. These measures fall into two basic categories (Murray et al., 2009): (1) health expectancies - measure years of life gained or years of improved quality of life (e.g. disability-adjusted life expectancy, healthy adjusted life expectancy, quality adjusted life expectancy), (2) health gaps - measure lost years of full health in comparison with some "ideal" health status or accepted standard (e.g. potential years of life lost, healthy years of life lost, quality adjusted life years, disability adjusted life years).

In this paper disability adjusted life years (DALYs) estimates are used to compare disease burden in populations. The DALYs are computed for a specific disease or a group of diseases such that, the total time lost due to premature mortality in a population is added to the total time lost due to a disability. Formally, DALYs expresse the equivalent of health years that have been lost due to years of illness or disability of a certain degree of severity and duration (YLD) and the number of years of death lost due to premature death (YLL). The YLL is estimated as the number of people who died at a particular age, multiplied by the total standard number of years to survive by persons of a certain age in which the death occurred. The estimation of YLD for a specific cause in a specific time period requires multiplying the number of cases of a given event in a given period by the average duration of the disease and by the weight factor. One year of DALY is understood as one year of lost healthy life. The

disadvantage of DALYs is the often missing data needed to calculate it, e.g. the incidence of diseases by age and sex, the number of cases of disabling illness, the average age of disability in the population, duration of disability, and the number of disabilities (Gromulska et al., 2008). For this reason, the DALY value is generally estimated. Details on DALYs estimation, methodological and ethical issues are described in a literature e.g. Gold et al. (2002).

4   Leading death causes among the elderly in selected European countries

Over the last quarter century, despite the evidence of the increase in the number of people aged 65+ and the increase in the number of deaths in this group, the intensity of mortality has significantly decreased. These changes are reflected in the lengthening of the life expectancy. Moreover, moving the largest percentage of deaths towards increasingly older age groups also indicates an improvement in the health of the population.

The analysis is carried out on the example of three countries. There are two main reasons for selecting only three European countries (Denmark, Poland, France) to the analysis. Firstly, according to some analysis (e.g. Majewska, 2017; Lazar et. al., 2016) they represent groups of countries with different trends of life expectancy and different pace of life expectancy rise. Secondly, the age structure of cardiovascular mortality – that plays the major role in the second stage of health transition – is much older in Denmark and France than in Poland (see Vallin and Mesle, 2005). Besides, according to existing research from late 90s French population completed the second stage of health transition and they enter the third stage, whereas Denmark actually has started to catch up on France.

Below, the mortality of the elderly (65+) are examined not only in the basic groups of causes of death (caused by diseases such as cardiovascular diseases and cancer), but also mortality caused by specific chronic diseases. Therefore, ten broad groups of causes of death are analyzed: (1) cardiovascular diseases, (2) respiratory diseases, (3) cirrhosis and other chronic liver diseases, (4) diabetes, blood diseases, and genitourinary system, (5) digestive diseases, (6) mental and substance use disorders, (7) musculoskeletal disorders, (8) neoplasms, (9) neurological disorders, (10) other non-communicable diseases.

According to the Global Burden of Disease (GDB, 2015) we conclude that in terms of the number of YLLs due to premature death in Denmark ischemic heart disease, trachea, bronchus, and lung cancers, and cerebrovascular disease were the highest ranking causes, in France – ischemic heart disease, trachea, bronchus, and lung cancers, and cerebrovascular disease, and in Poland – ischemic heart disease, cerebrovascular disease, and trachea,

bronchus, and lung cancers. Besides, the leading risk factor is tobacco smoking in Denmark, in France and Poland – dietary risks.

The main causes of DALYs and percent change between 1990 and 2016 are presented in Fig. 2 - 5. Bars going up show the percent by which DALYs have increased since 1990. Bars going down show the percent by which DALYs have decreased. In Poland mental and substance use disorders in male group, and neurological disorders are on the rise. Whereas in France – musculoskeletal disorders and neurological disorders are on the rise. It is noteworthy that the group of neurological disorders includes Alzheimer's and Parkinson's diseases. The interesting thing is observed in case of Denmark – the rise of DALYs in five groups of disease, which was not observed in this country at the end of the previous century (compare Vallin and Mesle, 2005). This is related with a slowdown in increase of life expectancy in the last years.
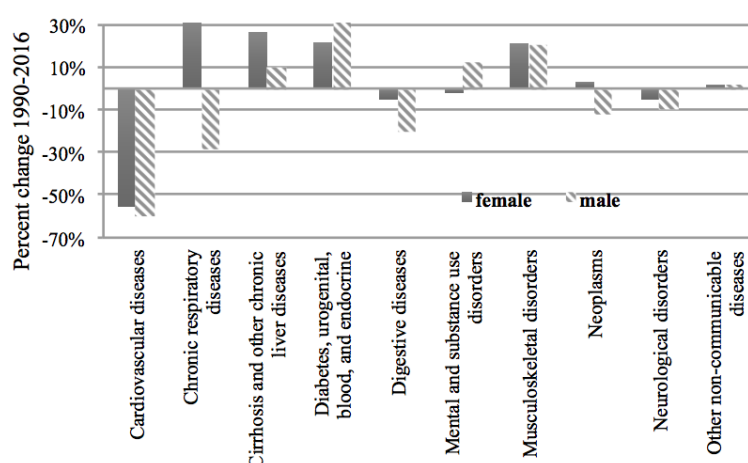

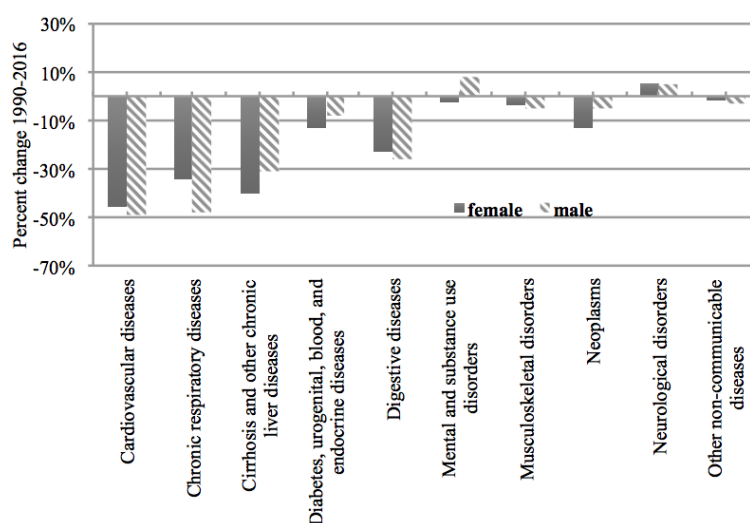**Fig. 2** Leading causes of DALYs and percent change 1990 to 2016 for Denmark.

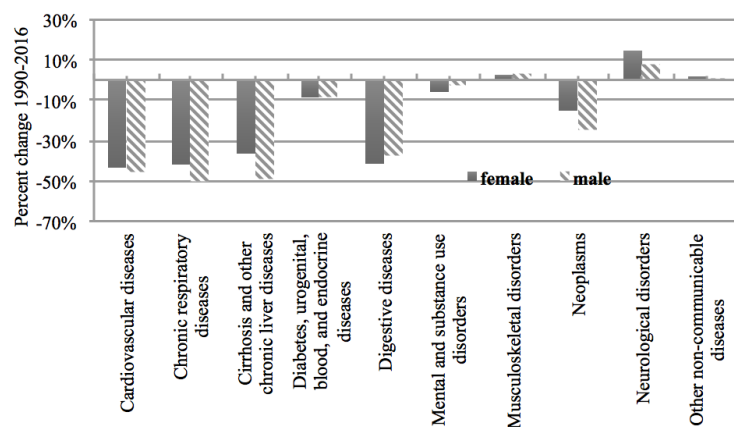**Fig. 3** Leading causes of DALYs and percent change 1990 to 2016 for Poland.

Fig. 4 Leading causes of DALYs and percent change 1990 to 2016 for France.

The above results are evidence for effective fight against diseases, mainly cardiovascular diseases (despite significant participation of this group in all analyzed causes of deaths).

5 Contribution of trends in age-specific mortality for the main groups of causes in two stages of changes in life expectancy

A necessary condition for entering the third phase of transition is an uninterrupted increase in life expectancy. However, has there been a slowdown in the aging process and a shift in the emergence of diseases over time?

Fig. 5-7 present the results of the decomposition of changes in life expectancy (in two periods 1990-2002 and 2003-2016, for seven age groups) taking into account the basic causes of deaths. Only the results for female are presented. Positive numerical values of the decomposition of changes in life expectancy signify an increase in life expectancy resulting from the improvement of health and reduction of mortality caused by various causes, while negative values mean a decrease in life expectancy associated with worsening mortality in a given group of deaths (Wróblewska, 2015). The decomposition was made by age using the Arriaga method (1984). The graph show the results of decomposition only for women, as the probability of entering the third phase of transition is much higher for this group.

The obtained results illustrate significant differences in the share of death cause groups in the increase in life expectancy for women between the periods. Although it can be seen that in the period 2003-2016 favorable changes occur, i.e. lifetime increases associated with a drop in mortality in the analyzed groups of causes of deaths, but the shift of deaths – for example for the group of cardiovascular diseases for Poland – from the age group 65-69 to 95+ is not visible. Therefore, it is not possible to talk about the entry of women into the third phase of health transition in case of Poland. But the trends are moving in the right direction. In case of

Denmark unfavorable changes that occur in recent decades in the mortality of older people are clearly observed. Neoplasms mortality is becoming an increasing problem, and this is very far from a new stage in the health transition devoted to the fight against ageing. France is very good example for shifting diseases toward older groups.
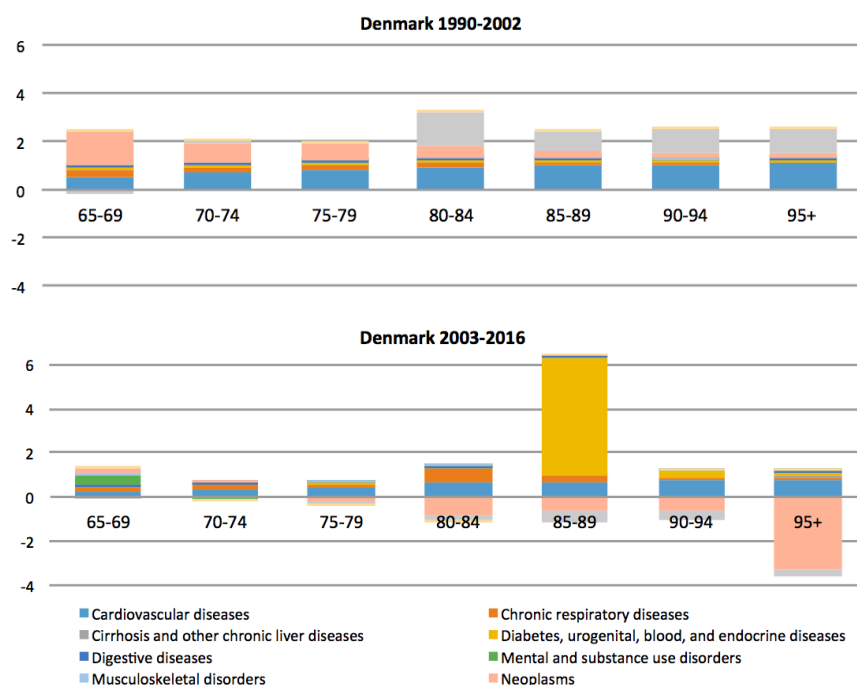

Fig. 5 Contribution of trends in age-specific mortality for 10 main groups of causes in two stages of changes in female life expectancy in Denmark.
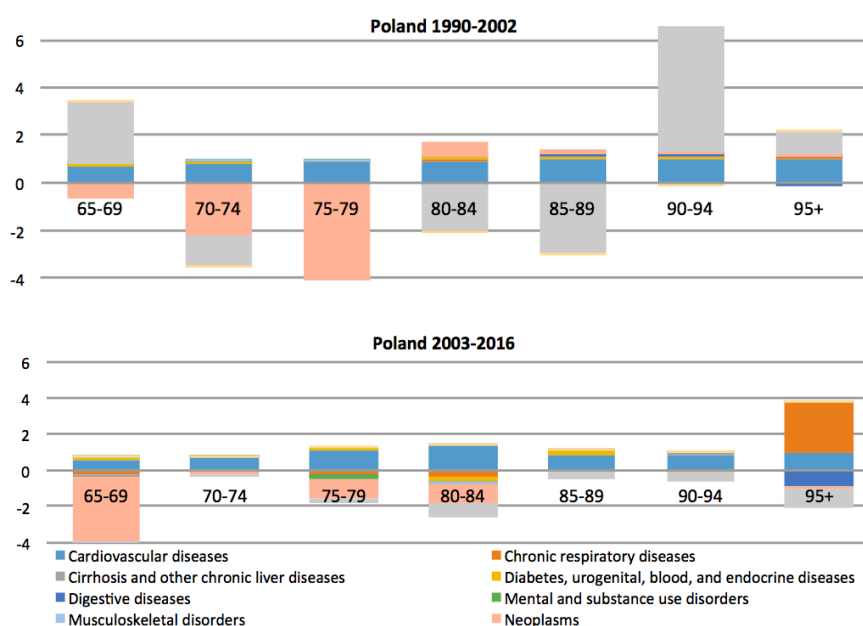

Fig. 6 Contribution of trends in age-specific mortality for 10 main groups of causes in two stages of changes in female life expectancy in Poland.
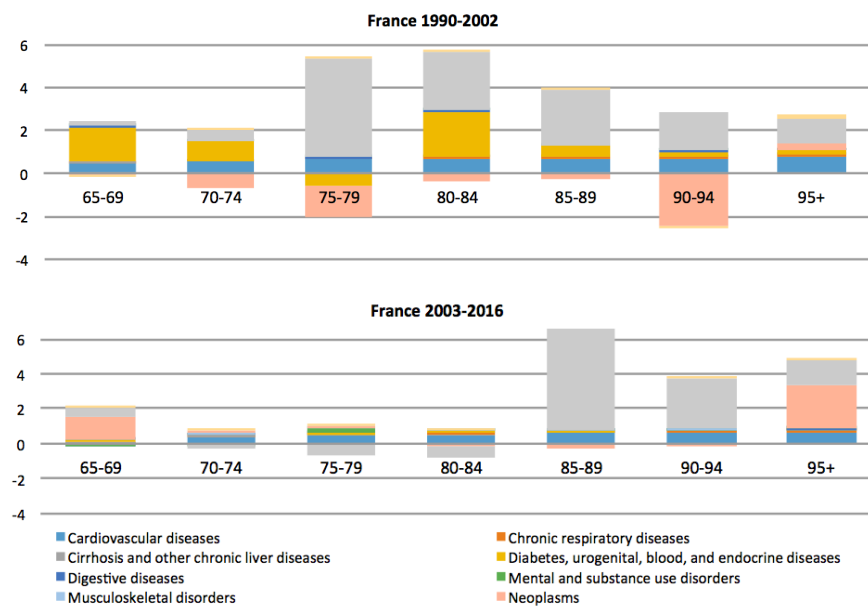
Fig. 7 Contribution of trends in age-specific mortality for 10 main groups of causes in two stages of changes in female life expectancy in France.

Conclusions

In the article the diagnosis of the changes in the mortality and health status of the older people over the past 26 years (1990-2016) were made. An analysis of mortality in three countries showed that issue of health transition and an assessment if a population entered the third stage is more complex than the theory describes. There is clear evidence that the life expectancy increases due to the effective fight against diseases, especially cardiovascular diseases. However, nowadays inference about the transition from the second to the third stage should also include the complex analysis of diseases strictly related with old people like neurological diseases. According to the analysis of Vallin and Meslé (2004), Denmark was a great example of country with perspectives on stepping to the third stage of health transition, however this analysis shows that increasing neoplasms mortality seems to distance from entering the third phase. For future analysis of health transition it is necessary to assess the impact of neurological diseases (like Alzheimer's, Parkinson's) and all diseases that depends on health behaviors and living conditions that are projected to greatly increase.

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