

Life Tables for the Old-age and the Disability Pensioners' in 2008 How Long Will They Receive Their Pensions in Hungary?

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Abstract

One of the key issues in our lives: How long will we live? Other of the key issues in our lives: How long will we get or enjoy our pensions? In this analysis I focus on the mortality of beneficiaries in receipt of old-age pensions and disability pensions in Hungary. My main objective is to demonstrate that the mortality of beneficiaries receiving different types of benefits may be significantly different from the mortality of the population. On the basis of the life tables presented I show the graduated probability of death corresponding to different ages, benefits and genders and also the expected number of future years at the given ages. Considering all these, I make comparison between the mortality of beneficiaries receiving different types of benefits and the mortality of the population.

Keywords: mortality of beneficiaries, retirement period, life tables for pensions, probability of death, life expectancy,

1. INTRODUCTION

In my opinion one of the key issues in our lives: **How long will we live? How long will we get or enjoy our pensions?**

The mortality of pensioners is a crucial issue even for insurance companies and pension funds dealing with life insurance (besides pension insurance and health insurance sectors). The data of mortality may be calculated in the knowledge of the risk community of certain groups, their probability of death, life expectancies, just like special types of life insurance.

One of the essential components of population projections is a projection of mortality, which is the subject of this study.

Life tables of the population are of high importance in the Social Security coverage. The present topic is also crucial when considering pension system possibilities of financing. They are also widely used when estimating the future financial status of the Hospital Insurance and Supplementary Medical Insurance programmers.

The research deals with issues particularly in the field of death and mortality, and gender differences in ages of the different points of view, such as marital status by region, mortality by level of education. A lot of studies deal with the causes of death, as well.

In this analysis I focus on the mortality of beneficiaries in receipt of old-age pensions and disability pensions in Hungary. My main objective is to demonstrate that the mortality of beneficiaries receiving different types of benefits may be significantly different from the **mortality of the population. On the basis of the life tables presented I show the graduated probability of death corresponding to different ages, benefits and genders and also the expected number of future years at the given ages.** Considering all these, I make comparison between the mortality of beneficiaries receiving different types of benefits and the mortality of the population.

For completing my work, I have used the data on the number of pensioners and their mortality.

2. MATERIALS AND METHODS

The mortality of people entitled to pensions and pension-type benefits in 2008 has been analyzed in details. The database of the Central Administration of National Pension Institute (CANPI) keeps records of the data of 3 million pensioners in the total 10 millions' Hungarian population, whereas source of data on Hungarian population and mortality has been the publication of the Central Statistical Office.

According to the international methodology for pension, retirement benefit recipients, age, beneficiaries of disability pension, I **have prepared** several **life tables**. *The age specific mortality of a given population at a given time can be described through a life table. (The life table may be applied for the characterization of the conditions of mortality of a population at a given time.)*

Life tables are based on the data of 2008. I have calculated the **main indicators of mortality** (probability of death, life expectancy).

The age specific death rate is calculated (age specific death rate) (m_x), which means dividing the number of persons dying at a given age x by the number of population of age x .

Expressed through a formula:
$$m_x = \frac{D_x}{P_x}$$

The crude probability of death is also calculated:
$$Q_x = \frac{m_x}{1 + \frac{1}{2}m_x}$$

The functions of persons surviving: l_x . In the present study: $l_{30} = 100\ 000$ in the case of old-age pensioners: $l_{57} = 100\ 000$.

Life expectancy at age 'x' is calculated by applying the formula:
$$e_x^0 = \frac{\sum_{i=1}^w l_{x+i}}{l_x} + \frac{1}{2}$$

Graduation:

For ages $30 \leq x \leq 75$ the **Karup-King osculatory interpolation** is used. The pivotal values are

$$\bar{q}_x = 1,08Z_x - 0,04(Z_{x-5} + Z_{x+5}) \quad (x= 30, 35, \dots, 75)$$

$$\text{where } Z_x = \frac{\sum_{i=-2}^2 q_{x+i}}{5}$$

Then the graduated values are calculated by the formula

$$\overline{q_{x+n}} = \sum \alpha_{nj} Z_{x+5(j-3)} \quad (x=30, 35, \dots, 70; \quad , 0 \leq n \leq 4)$$

where $\mathbf{n_j}$ is the $(n+1)$ st entry in the \mathbf{j} th row of the following matrix:

| | | | | | |
|----------|-----------|----------|-----------|-----------|----------|
| 0 | -0,040000 | 1,080000 | -0,040000 | 0 | 0 |
| 0,002560 | -0,105600 | 0,980800 | 0,145600 | -0,024000 | 0,000640 |
| 0,002880 | -0,105600 | 0,737600 | 0,432000 | -0,068800 | 0,001920 |
| 0,001920 | -0,068800 | 0,432000 | 0,737600 | -0,105600 | 0,002880 |
| 0,000640 | -0,024000 | 0,145600 | 0,980800 | -0,105600 | 0,002560 |

For ages 76 and over a **Gompertz–Makeham function** is applied:

$$1 - \overline{q_x} = \overline{p_x} = e^{a+bc^x}$$

$$\text{First we estimate the parameter: } c = \sqrt[5]{\frac{H_3 - H_2}{H_2 - H_1}}, \text{ where } H_k = \sum_{i=0}^4 \ln p_{76+5(k-1)+i}$$

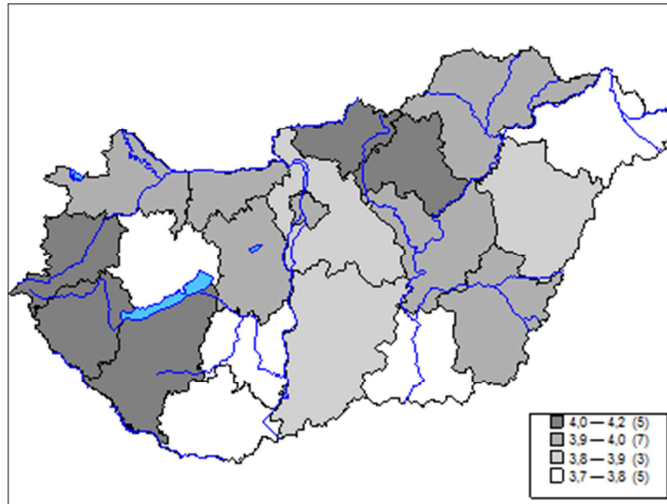
Parameters \mathbf{a} and \mathbf{b} are estimated by the least squares method on the basis of the same fifteen years.

3. RESULTS

3.1 Number of deaths in Hungary

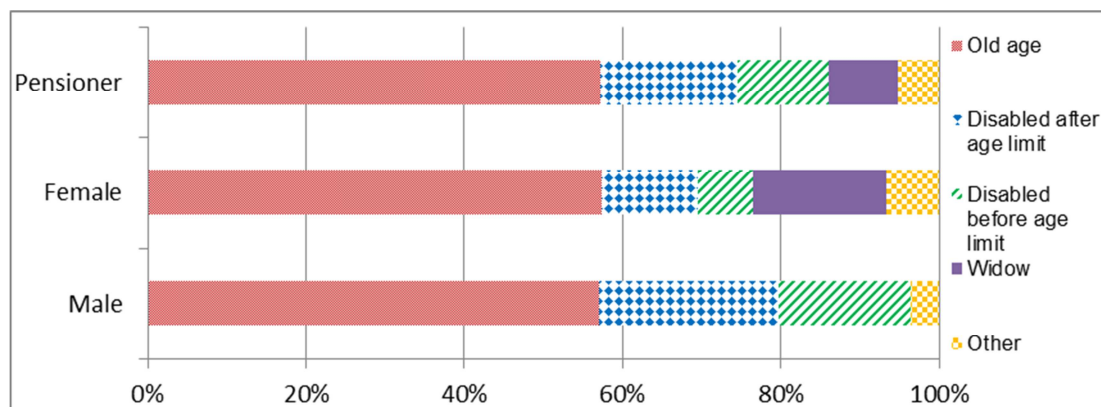
The mortality of people entitled to pensions and pension-type benefits in 2008 has been analyzed in details. The database of the Central Administration of National Pension Institute (CANPI) keeps records of the data of 3 million pensioners in the total 10 millions' Hungarian population, as well as the data of 118 thousand pensioners in the total 132 thousand annual Hungarian deaths. 90% of the people dying are pensioners. The majority of people die as a pensioner at an old age and that is why this topic is of extraordinary importance.

Figure 1 - The proportion of pensioners who died in 2008 in Hungary was 3.9%



When examining the number of beneficiaries dying in 2008, we found that 57,2% of them were entitled to old-age pension. I got similar percentages for men and women. 17,3% was in receipt of disability pension above retirement age, which rate was much higher for males (22,7%) than for females (12,2%). 11,6% received disability pension under retirement age also with a higher rate for males (16,6%) than for females (6,9%). As a full benefit, 16,5% of recipients of widow(er)'s pension above retirement age are women. I hereby mention that only those are considered who have no old-age pension on own right, that's the reason why there is only an insignificant percentage of males in this category.

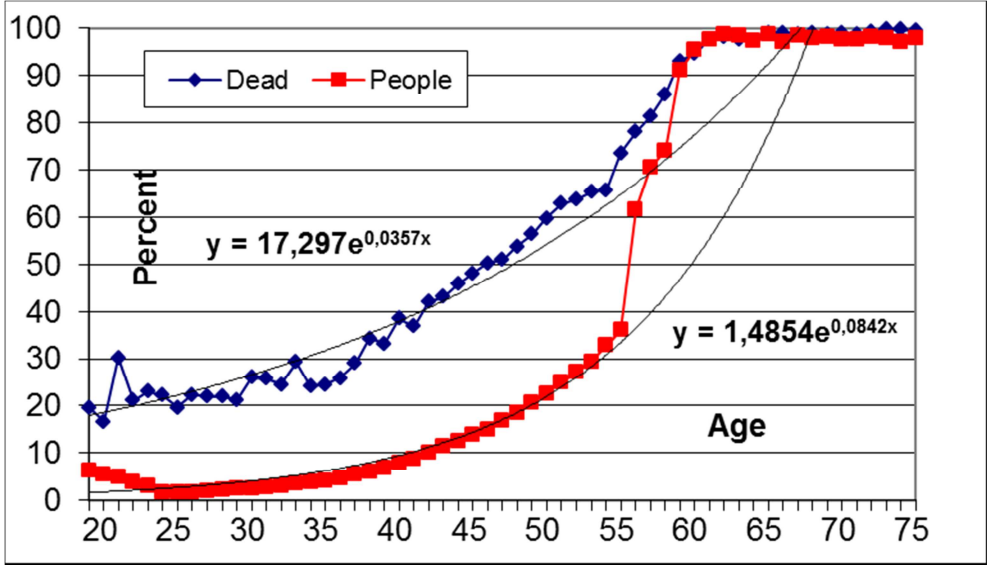
Figure 2 - Distribution of death data of pensioners in 2008



The following chart shows the ratios of beneficiaries of pensions and pension-type benefits dying in 2008 by age, compared to the overall number of deaths in Hungary, as well as the proportion of pensioners compared to the whole population also by age. The diagram demonstrates that above 62 years of age, for every age, both ratios of mortality and number of

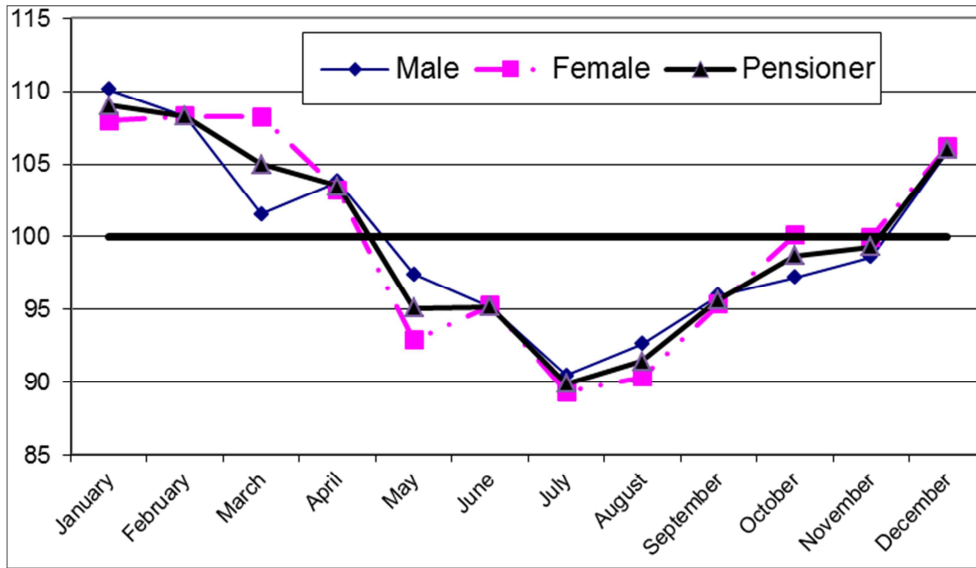
beneficiaries are close to 100%, certainly, as almost everybody obtains some kind of benefit over 62 years of age. My other observation is that above age 45, a significant part of the people who die from that age group, are disability pensioners or the beneficiaries of other benefits received at a younger age.

Figure 3 - *The ratio of pensioners died in 2008 compared to the total number of deaths in Hungary and the proportion of beneficiaries compared to the population at different ages (%)*



Afterwards, I examined whether the monthly data on deaths show a difference between the two genders with regard to beneficiaries of pensions and pension-type benefits. Choosing the method of standardization, I represent the proportion of the number of deaths, in percentage, in the given months compared to the yearly average. In 2008, there were a high number of deaths among women, while there is a decrease concerning men after the relevant February rate. By analyzing the data of the other months, I can make the conclusions that the values referring to the two genders show a significant difference. (chart)

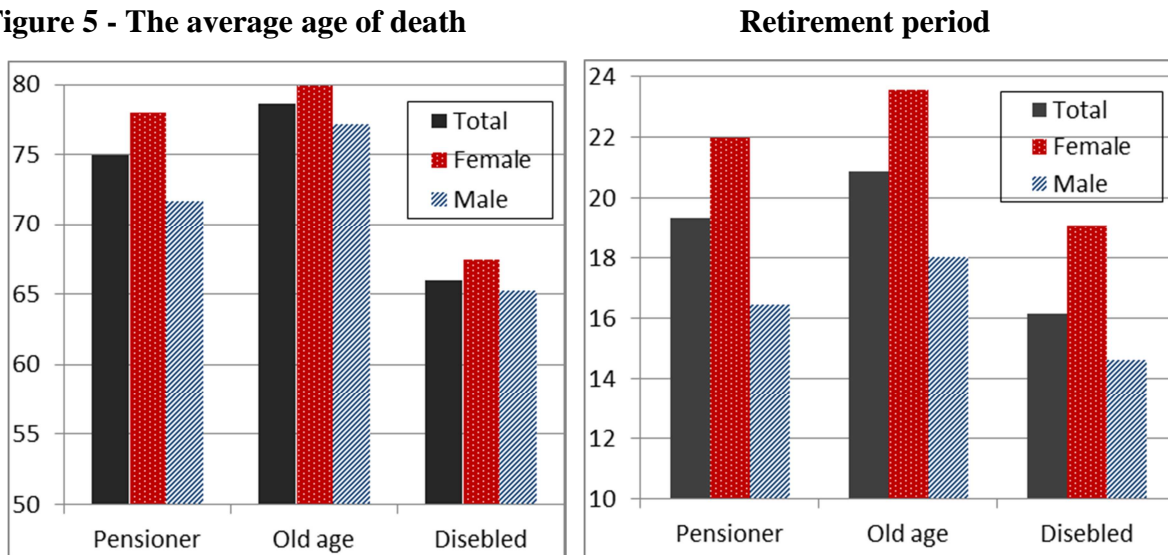
Figure 4 - Standardized mean number of deaths by month and gender in 2008 (%) (pensioners and pension-type benefits)



3.2 The average age of death, the retirement period

Relevant information can be gained by analyzing death data. The average age of death regarding pensioners in comparison with *all the beneficiaries* was 74.9 in 2008. Behind the mean value there are significant differences between male and female results. For males age 71.7, whereas for females age 77.9 respectively.

Figure 5 - The average age of death



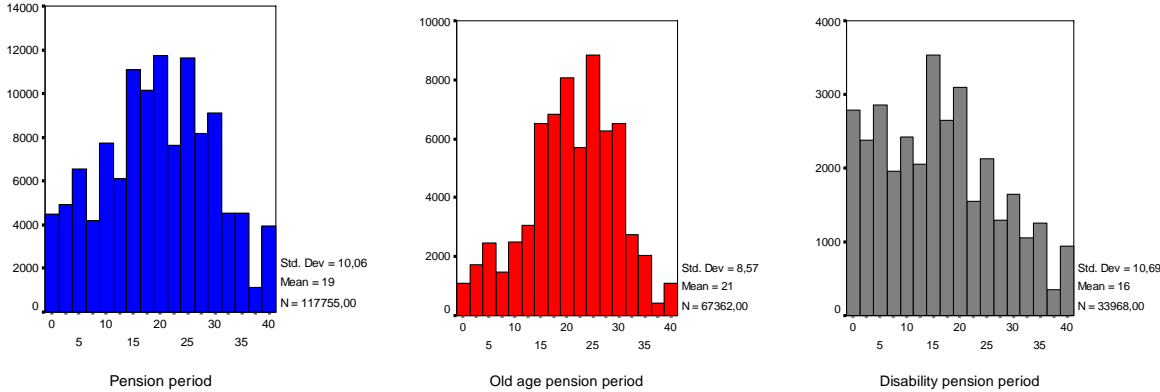
The distribution of the pension period for all beneficiaries died in 2008 every two years. Several peak periods may be detected between 17-25 years around the mean value (19.3

years). Many people died right after retirement, but it was not rare to spend 39-40 years in pension, either.

As far as old-age pensioners are concerned, we can see a totally different picture on Figure 2. Their distribution has no heavy tail/feature: very short and very long durations become less probable. The highest frequencies for those who died in 2008 lie between 15-30 years. The longest mean duration is 21.5 years.

The duration of disability pensioners' years spent in pension is 14.6 for male sand 19.1 for females, with a huge difference between those dying above or under the retirement age. A significant number of disability pensioners die within a short while after retirement. One quarter of males die within the first 6 years after becoming a beneficiary, whereas one quarter of females die only within the first 9 years.

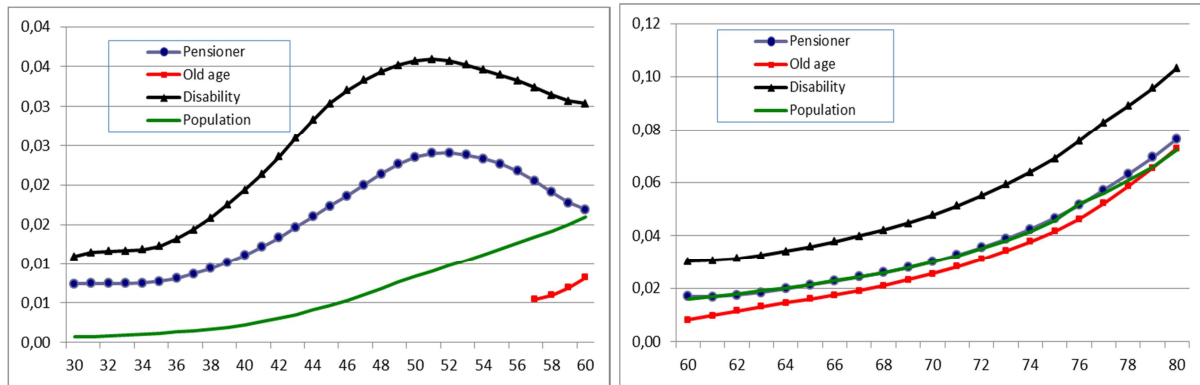
Figure 6 - Period of pension



3.3 Probability of Death

Chart 7 shows the graduated probabilities of death of old-age beneficiaries of pensions and pension-type benefits, pensioners and disability pensioners between ages 30 and 80. Under 60 years of age, the differences are significant. The life prospects of disability pensioners are much worse than those of the population. Above 60, there is no important difference between the probabilities of death of the population and the beneficiaries of pensions and pension-type benefits and the mortality of old-age pensioners' shows better values than that of disability pensioners, as well.

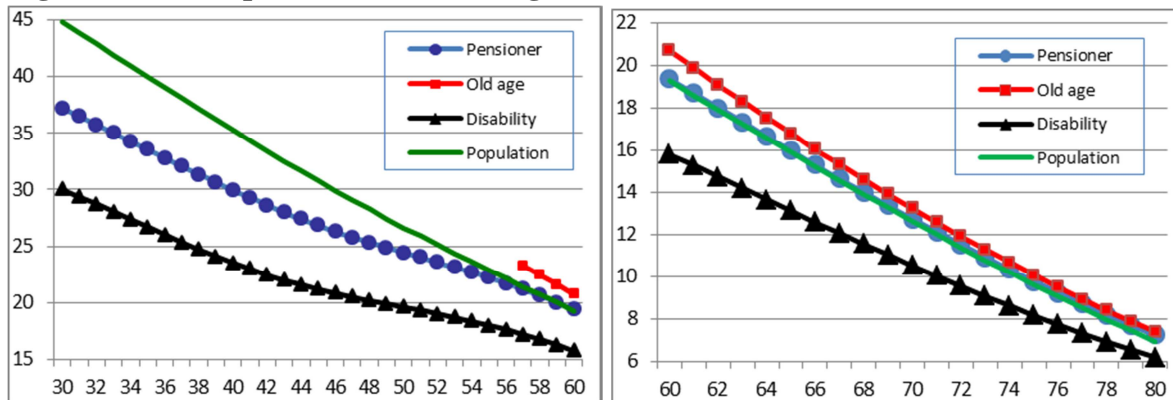
Figure 7 - The probabilities of death between ages 30 and 80



3.4 Average life expectancy

It indicates average life expectancy measured in years for people of various ages under the mortality conditions of the given year.

Figure 8 - Life expectancies between ages 30 and 80



It is rather obvious that old age pensioners have much better life expectancy than disability pensioners.

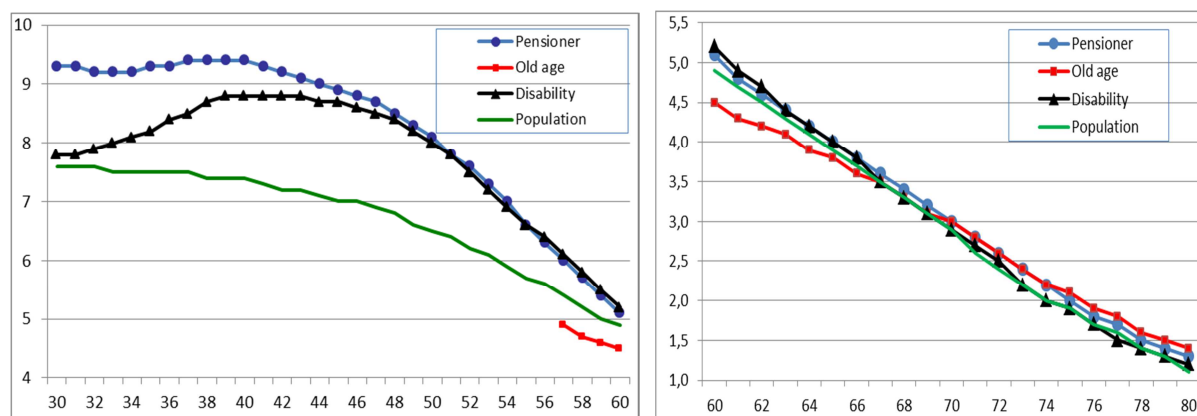
Pensioners and population data are the same above age 58 for both indices.

3.5 The difference between genders

The life expectancy of males and females significantly differ from each other in every category of pension. On the whole, women have a higher life expectancy. At an active working age, the difference after retirement is a lot bigger than the rate calculated for the population. At the age of 40, female old-age pensioners have 9.4 and disability pensioners 8.8 years, whereas female population has 7.4 years higher life expectancies than males.

The difference between sexes is decreasing with age - first slowly, later more and more quickly. At the age of 68, the difference is 3.3 years for both old-age and disability pensioners just like for the population.

Figure 9 - The extra life expectancy of women in terms of age



3.6 The probabilities of death between the two exact years of age

I hereunder present the dimensions of probabilities of death between ages 30 and 40, 40 and 50, 50 and 60, 60 and 70, 70 and 80 as well as 80 and 90. This refers to the probability of an individual aged x dying within n years.

As regards young generations, it is a general tendency that the probability of death of the population is much lower than that of pensioners. It is also easy to see concerning persons of working age. Between ages 50 and 60, the probability of death among the population is rather high, 11%, whereas that of the pensioners is almost double this value, while that of disability pensioners is nearly triple.

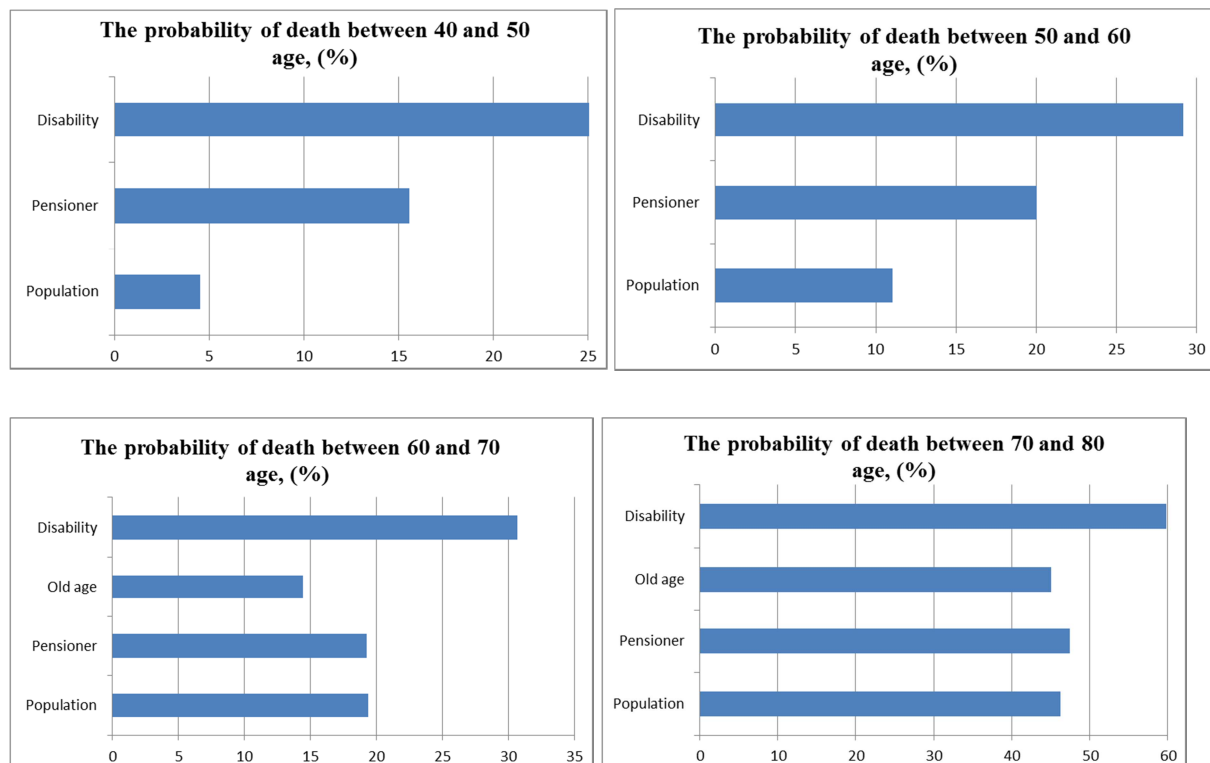
The majority of deaths occur at a senior age. In the proportions of persons between 70 and 80, there are smaller differences as fewer old-age pensioners and more disability pensioners die with regard to the Hungarian population. The situation changes between ages 80 and 90. The life prospects of the population become worse than those of pensioners, even only in a small degree. In the table below, I make a summary of the probabilities of death between the two exact years of age as a result of my calculations. The following charts clearly demonstrate the significant differences.

Table

The probabilities of death between the two exact years of age, in percent

| Age | Population | Pensioner | Old age | Disability |
|-------|------------|-----------|---------|------------|
| 30-40 | 1,2 | 7,9 | | 12,4 |
| 40-50 | 4,5 | 15,5 | | 25,0 |
| 50-60 | 11,0 | 20,0 | | 29,2 |
| 60-70 | 19,3 | 19,3 | 14,4 | 30,7 |
| 70-80 | 46,3 | 47,5 | 45,0 | 59,8 |
| 80-90 | 87,4 | 82,1 | 81,3 | 87,2 |

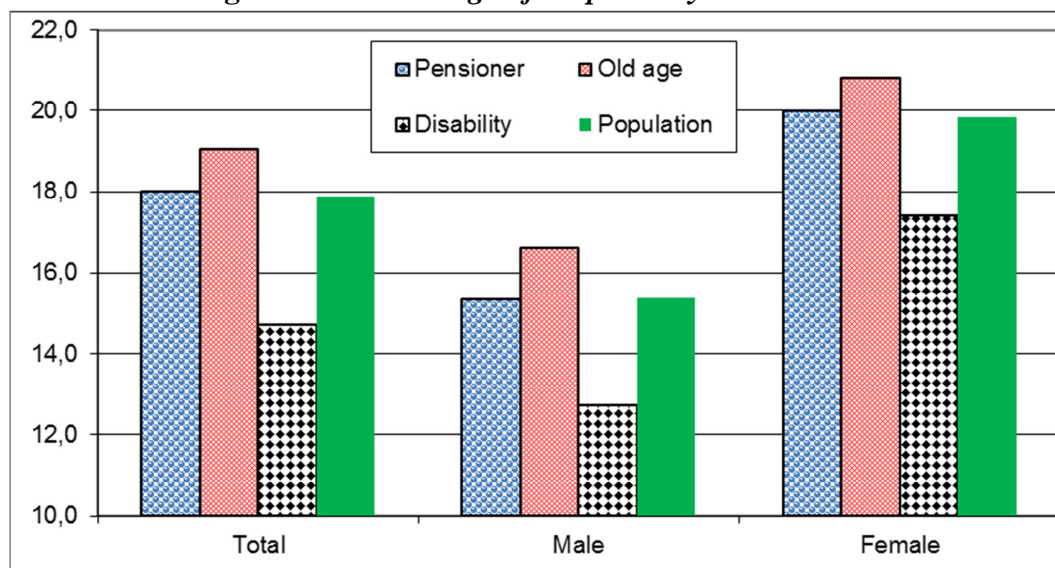
Figure 10 – The probability of death within 10 years by 10 years of age



In Hungary, the statutory retirement age is 62 years, which is of crucial importance. Pensioners can expect to live another 18 years on average: old-age pensioners 19,1, while disability pensioners 14,7 years, thus, they will receive their pensions for the same period of time.

Regarding males and females, it is also true that the *average life expectancy of old-age pensioners is the highest, whereas that of disability pensioners is the lowest. At the same time, there is a significant difference between the two, however.*

Figure 9 - The average life expectancy at 62 in 2008



4. CONCLUSIONS

Because of the aging of society, old age and disability pensioners' mortality has become a crucial issue – in respect of the financing scheme of a pension system, not only in Hungary, but also worldwide. Mortality is a key question in every field of health sector, as well.

To summarize, the analysis of the results of life tables data prepared by me demonstrates that it was worth elaborating and examining the data of death of the beneficiaries of pensions and pension-type benefits for 2008. The above presented life tables are practical and efficient to use. The results of the analysis of mortality offer a great opportunity to draw conclusions, as well.

The present issue is also vital to consider for how many more years the benefits should be provided regarding different types of benefits in order to make our pension systems sustainable not only in Hungary, but also in other countries of the world.

I thank Hollósné dr. Marosi Judit for her assistance in my calculations and professional support.

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Further information

Papers and studies available in Hungarian:

http://www.onyf.hu/index.php?module=news&fname=onyf_left_menu_statisztika_elemzesek&root=ONYF

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